the Petroleum Engineer

FOR MANAGEMENT

INTEGRATED EDITION OF THE PETROLEUM ENGINEER

How Does Your Management Rate?

Deep Well Survey, 1956

You, too, Can Write Technical Articles

Buyer's Guide for Processing and Petrochemicals

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the Petroleum Engineer

FOR MANAGEMENT

NUMBER 3 • VOLUME XXIX • MARCH, 1957

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That Perennial Villain, the Oil Industry

The public is worried about the cool war, inflation, taxes, integration, drouth, and floods.

With many problems and worries in this year of prosperity and no one willing to take the blame, the headline makers have reached again for that old standby whipping boy – the oil industry. Now you can't hear the lines for the hisses. Who cares what the plot is – the dastardly villain is on the stage.

The oil industry – or more specifically the Texas Railroad Commission – could clear up the Middle East muddle, save the peace and keep Europe in comfort and well being if it weren't a black-hearted scoundrel. It's the oil industry's fault that pipelines go into our own great consuming centers of the North and East and not to coastal terminals where they could carry oil to ship to Europe. Of course Europe hasn't bought much oil from us for a good many years but the oil industry, if it weren't a knave, would be prepared for anything. It should have known that the Suez was going to be sabotaged, whether the State Department did or not.

The oil industry caused inflation, too, of course. It was so busy keeping ahead of the steadily growing demand that it didn't even have time to twist its sleek mustache and demand the mortgage money for a whole three and a half years. The unmitigated coward was living off its capital.

Wages went up, steel went up, equipment went up, interest went up. The largest federal budget in peacetime is proposed and state and local governments are in there pitching for higher budgets. Who complains? Did you? Hardly a protest could be heard until the oil industry tried to get a little ahead with a timid raise that hasn't touched all production yet. You know what happened – the hisses are still heard 'round the world.

So that familiar old ready-made villain brought on inflation and nobody will tell you otherwise. Anyway, he couldn't be heard if he tried among the screaming headlines.

It isn't exactly clear but you'll find taxes are somehow the oil industry's fault, too. If not, why should it take on all those taxes? No other industry provides so much tax money for federal and state and local governments. Do you know that gasoline went up only 6 percent since 1953 but gasoline taxes went up 19.6 percent?

No other industry would stand still for taxes being slapped on it right and left. It's practically against the law in some states to mention the amount of tax on each gallon of gasoline. "Don't blame us," the taxers say, "blame that wicked oil industry."

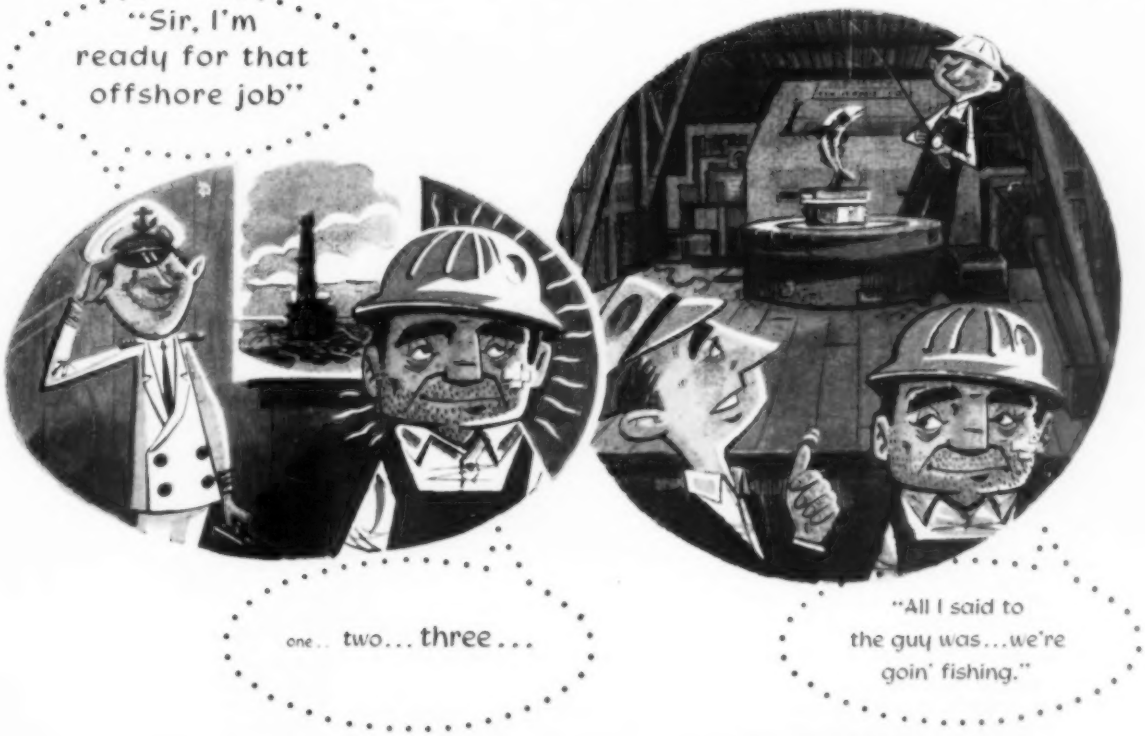
Our modern journals call anyone with a 1/64-acre of royalty, "Oil-Rich So-and-So," but you can wonder all day where every one or anyone else draws his pay. You'd naturally assume that if all the rich oil men were laid end to end, we'd have a well tailored path to the moon.

Maybe being a whipping boy is good for the soul. It keeps us humble and more than a little anxious. It keeps us working hard and learning how to do things better every day. It pulls out a sense of humor when accusations are so ridiculous they are comic. Some day perhaps it will even help us understand why the oil industry is always type-cast as the villain of the piece.

That will be the day when we will be ready to apply for the hero's role.

Ernestine Adams

Win $25.. write a Joe Roughneck cartoon line



Joe Roughneck is a sort of composite spirit of the men who drill for and produce vital oil. You probably know dozens of Joe Roughnecks . . . men on rigs in the field and men running progressive companies. Lone Star is dedicated to supplying them with API casing, tubing and line pipe.

Drawing on your own experience and things you've heard . . . send us a Joe Roughneck cartoon line and suggestion for illustration. For every one that we use in our ads, we'll pay $25. Send in your oil field smile lines now. In case the same line is sent in by more than one person, the one with the earliest postmark will collect. All entries become the property of Lone Star Steel. Our employees, our advertising agency and their families may not compete.

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THIS INDEX IS PROVIDED AS AN ADDITIONAL SERVICE FOR OUR READERS—THE PUBLISHER ASSUMES NO RESPONSIBILITY FOR ERRORS OR OMISSIONS

IN CO_2 CORROSION...

Grade "L" Sucker Rods provide their own inhibitor

METALLURGISTS and oilfield operators know by their records that "Oilwell's" Grade "L" Sucker Rods far outlast other rods in carbon dioxide areas.

When these rods, which are high in nickel and chromium and are fully normalized and tempered, are subjected to carbon dioxide (sweet type) corrosion, a thin deposit of calcareous substances quickly forms on the rod's surface. The rod's unique grain structure promotes the retention of this deposit as a thin surface coating which insulates the metal rod from further contact with corrosive elements; thus inhibiting further attacks on the metal and extending—sometimes indefinitely—its useful service life. The assistance of a chemical inhibitor is warranted, however, in severe corrosive conditions.

TYPICAL REPORTS: "My Grade 'L' Sucker Rods were slick as a mole's tail, even after three years." "I've been using Grade 'L' Sucker Rods for 16 to 18 months, where the more expensive rod strings I previously used would fail from corrosion and have to be replaced every 1 to 3 months."

As a matter of fact, service life 2 to 3 times longer is common when "Oilwell" Grade "L" Sucker Rods are used to resist CO_2 corrosive conditions.

SEND for a free copy of our Sucker Rod Comparison Chart . . . and let an "Oilwell" Production Specialist show you why Grade "L" Sucker Rods are superior to other rods in combatting "ringworm" corrosion. Then try alternating Grade "L" with the rods you previously favored . . . in your own well.

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UNITED STATES STEEL

Petroleum Profile

CARL E. REISTLE, JR.
Vice President
Humble Oil and
Refining Company

YOU often hear how someone discovered a field that produces so many barrels of oil a day.

Maybe some day our giant computers can figure out how many barrels of oil have been produced simply because of the technological work of one particular person.

When they do that, Carl Ernest Reistle, Jr., could well top the list, not only because he heads the production department of the largest domestic oil-producing company, but because every production operation is influenced by his ideas, his studies, his faith in engineering methods.

A native of Denver, Colorado, Carl moved with his parents to Oklahoma City and grew up at the time the state's oil industry was booming.

Attracted by the romance of oil, he chose chemical engineering when he entered Oklahoma University in 1918. In summers he got a more practical view, working as a roustabout for Carter Oil Company.

June, 1922, was an important month in Reistle's life. He graduated from OU, married Mattie Ann Muldrow, daughter of one of the University Regents, and joined the U. S. Bureau of Mines staff.

His decision to go with the Bureau of Mines' petroleum branch was a significant mark in the direction of his career. The station at Bartlesville, Oklahoma, was full of young scientists who proved themselves in later years. There were endless new problems to be solved in oil production. Soon Reistle was sent to the famous Salt Creek field in Wyoming to work on a method of determining oil gravity. When the Laramie, Wyoming, station of the Bureau was opened in 1924, he was appointed to the permanent staff there. With D. B. Dow, he began some of the first experiments on the solubility of gas in oil. A paper on their work, "Absorption of Natural Gas and Air in Crude Petroleum," was among the first ever published that recognized the solubility of natural gas in crude oil.

For the next couple of years, he worked on methods of dealing with paraffin problems and on chemical analysis of oil-field waters. Reports on his work commanded attention because of the growing need for engineering methods in the young and expanding industry.

In the early 30's the great East Texas oil field poured economic disaster into an already overflowing production area. Supply depressed the market until oil was down to 10 cents a barrel. Reistle's eager and persistent work on oil reservoirs for 10 years made him a natural for directing a sane approach to East Texas problems. He was sent there by the Bureau of Mines and later became chairman of the East Texas Engineering Association, formed by operators in the field.

Reistle once told young engineers that they should be skilled in human relations — should be able to work as a member of the team. Perhaps the highest proof of his own ability in human relations came during the effort to bring conservation to the chaotic conditions in East Texas. Every operator had to cooperate and it took more than courage and logic—it took patience, persuasion and an ability to appreciate and understand operators' problems.

If we had that computer working, we might find out how much East Texas oil that was saved for a better price and a greater need, was due to human relations and how much to technology. Whatever the answer, a lot was certainly due to Carl Reistle.

The management of Humble Oil and Refining Company, a large operator in the field, saw and liked Reistle in action and offered the job of engineer in charge of its engineering division in 1936. He accepted and in 1940 he advanced to chief petroleum engineer, was made general superintendent of production department in 1945 and then manager in the same year. He was elected to the board of directors in 1948 and to his present post as vice president in 1955.

Although he has been associated with a large company most of his career, he recognizes fully the importance of the independent to the industry. Asked what he considered the most important petroleum engineering enterprise, he said it was conservation. "Getting away from the rule of capture made independent operations possible," he said.

Since he has been with Humble, Reistle has been issued seven patents.

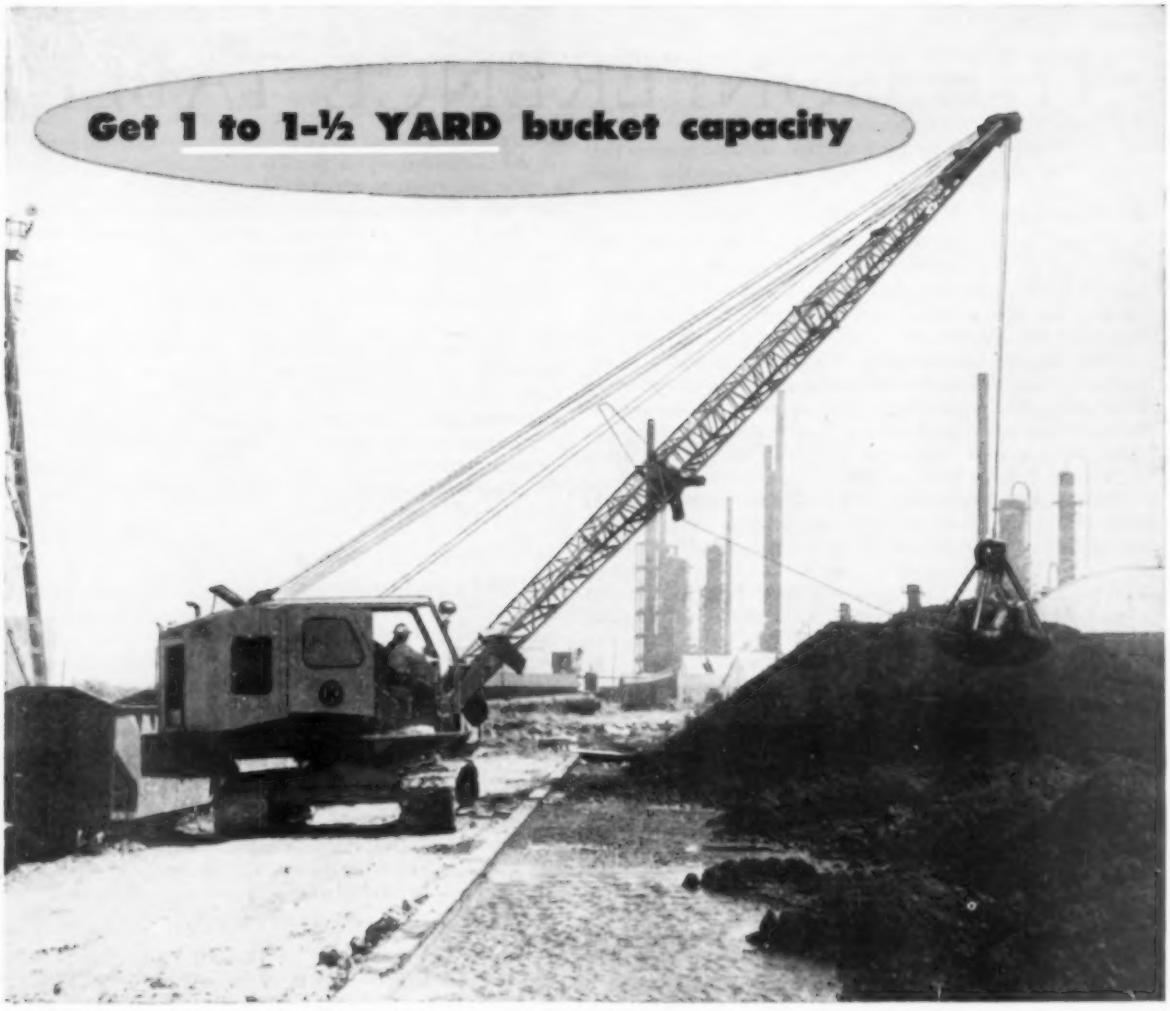
In 1956 he was president of the American Institute of Mining and Metallurgical Engineers, an organization which has benefited from his membership and professional support since 1924. He is a member of Alpha Chi Sigma, Sigma Tau, and Tau Beta Pi, engineering fraternities; Pi Epsilon Tau, honorary petroleum engineering fraternity; Sigma Xi, honorary science fraternity, and of the American Petroleum Institute.

One of his favorite projects is the Junior Achievement movement. He is a past president of the Houston Chapter and a member of its national board of directors.

Mr. and Mrs. Reistle live in Houston, Texas. They have four children: Mrs. George F. Pierce, Jr., Mrs. James T. Clark, Mrs. W. Hayes Holliday, and Carl Ernest Reistle III, and six grandchildren.

You can't draw a word portrait of Carl Reistle without telling about his enthusiasm for hunting and fishing. Some of his companions on a vacation trip will tell you that hunting and fishing rival engineering as an interest.

But most people believe that Humble's vice president in charge of production wants to be one thing above all else — a great petroleum engineer — and that is what he is.



20-TON lift capacity with Koehring 405 crane

Take another look at the heavy-duty crane shown here. It's the new 405 — latest addition to the Koehring line — and brings you a big advantage in *extra work capacity*. For example — with one of these 405's you're equipped to lift any load up to 20 tons. Boom lengths range from 40 to 90 feet. For added reach, 15 to 30-foot jib can be used on any length boom up to 80 feet. This gives you a maximum boom and jib of 110 feet.

Extra lift capacity and stability as a crane increases the Koehring 405's *work capacity* with all attachments. It handles 1 to 1½ yard clamshell or dragline buckets on a wide work radius — readily converts to 1-yard shovel or hoe. Here are some of the heavy-duty features that help you get more work done with every attachment: Big power clutch requires only 1/10th the lever pull of a comparative-size manual clutch — yet retains accurate "feel" of load. Automatic traction brakes also simplify operation — are engaged at all times, except when tractive power is applied — lock and hold the 405 when working or parked. Maintenance is simplified, too. There are only 2 main shafts in the 405's upper machinery. Each assembly is an independent unit with fully enclosed gears, and splined shafts rotating on anti-friction bearings. For more complete details, see Koehring distributor, or write for bulletin.

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THE CONFERENCE TABLE

Man's search for security is a search for death — ASHBY THADDEUS

A Hundred Billion in Taxes

Did you know that a full account of the government's estimated income and outgo in fiscal 1958 would show receipts of $99 billion instead of $72.6 billion, and expenditures of $96 billion instead of $71.8 billion. *The Wall Street Journal* points out that in the published figures we see only net expenditures and more importantly, whole programs are excluded from the budget. For instance, the Social Security Program and the new highway program are not in the regular budget. They are trust funds built up through specific taxes rather than general revenues. However, these trust funds come from nobody but us taxpayers.

For instance, instead of the $5 billion net that the federal government will spend for agriculture in fiscal 1958, actually the gross expenditures will come to more than $8 billion. According to the budget, the government proposes to spend $3.5 billion for labor and welfare in fiscal 1958. In addition to that it will be paying out $10½ billion for Social Security and other welfare from trust funds not included in the budget. But the money comes from us taxpayers.

It is hard to understand why the multi-billion dollar highway program can be kept out of the budget. It will be paid for by taxes on federal gasoline at three cents a gallon and who pays that tax? Not Uncle Sam.

The Federal government will syphon off much more than the $72.6 billion estimated for the budget.

Engineers Fewer Than Expected

Actual count of graduate engineers will run at least 10 percent less than the predicted figure for 1955-56 according to the Engineering Manpower Commission of Engineers Joint Council. The total of 31,621 includes 26,306 with the bachelors degree, 4,705 with a masters, and 610 with a doctors degree. Last year the total was 27,567 graduates. This means the increase was only 4054 over the year before.

The report seems to find some satisfaction in the number of enrollments for 1956-57, but the figures do not bear this out — enrollments from the first year to PhD graduate work this year are only 23,959 more than last year and the Office of Education estimates that only 57 percent of those who enter engineering courses complete them and obtain the bachelors degree. This seems pretty high attrition for engineering students and presents the idea that we should tackle the problem of keeping more in school instead of getting more to begin.

Research Personnel and Costs

Last year the National Science Foundation put out a preliminary report on a 1953-54 survey of science and engineering in American industry. Now the final report is released. There are a number of interesting facts revealed in the survey and, like all statistics, the report requires close attention to detail to know just what their statistics mean.

Part 1 discusses research and development costs and personnel. Slightly more than $4 billion was spent in 1954 by industry for research development activities, about 12 percent more than 1953. Industry accounts for about two thirds of the total research and development, with one third being work conducted for the federal government.

Some 157,000 scientists and engineers were employed in RD activities in the surveyed industries in January 1954. Of the 553,800 scientists and engineers employed in this country 38,500 are in petroleum products and extraction. However, exploration of any kind was excluded from the survey, which knocks out a great many research and development people in our industry.

This is also true of costs. Of the $4,089,000,000 spent on RD in 1954, only $162,000,000 was credited to the petroleum industry. This is obviously too low since exploration accounts for a fair portion of petroleum research and was excluded.

"Science and Engineering in American Industry can be obtained by writing to the Superintendent of Documents, U. S. Government Printing Offices, Washington 25, D.C. Price is 70 cents.

It's Official Now

We've already been told a number of times that the nation's factories and business establishments poured out a record $412 billion worth of goods and services last year. Now it has been announced formally by the Commerce Department. This is an increase of $22 billion or 5½ percent over 1955. About half the increase was the result of higher prices, so actual increase is only 2¾ percent.

By December 1956, the gross national product was at the annual rate of $424 billion. This increase was achieved despite a slump in auto production and home building.

The 1956 national income also set a new record of $342 billion, which is $18 billion more than in 1955. Personal income increased 6 percent to $306 billion.

You, Too, Are a Writer

We can't resist reprinting this plea for clear writing recently given by Robert Gunning to Dallas industrial editors. You may think that this issue is going too heavily on the writing theme when you also read John Kent's "How to Write Better Technical Articles," on page E-2. You may not write technical reports but you do write letters every day and sometimes speeches. You could put these 10 suggestions in a handy desk drawer and follow them to advantage. It will even be better for your correspondents.

1. **Keep sentences short.**
2. **Prefer the familiar to the unfamiliar.**
3. **Prefer simple to the complex.**
4. **Avoid unnecessary words.**
5. **Put action in your verbs.**
6. **Write like you talk.**
7. **Use terms your readers can picture.**
8. **Tie in with your readers' experience.**
9. **Make full use of variety.**
10. **Write to express not impress.**

Now turn to John Kent's article if you write technical reports or papers.

Company Encourages Writing

General Dynamics Convair Division encourages its engineers and scientists to write up findings for journals in their field. The company pays $150 for each article by a Convair man that is published. Of course, articles must be cleared by the writer's supervisor and by public relations.

We Want to Be Brothers, Too

Many oil industry people were provoked because Warner Bros. insisted that the movie of Edna Ferber's "Giant" include a big irrelevant scene on oil depletion allowance. It gave the impression that depletion for oil producers was simply a tax dodge. There seemed no particular reason for throwing in this gratuitous insult to the industry, but when a protest was made because of its inaccuracy, the producers refused to cut it.

Now the National Conference of Christians and Jews has named "Giant," among others, for "outstanding contribution to the cause of brotherhood." It was commended for depicting "with sensitivity the tensions that arise because of class, racial, religious, and cultural differences."

This is all very nice, but we'd like to throw in just for the record that there could be no award to "Giant" for fairness and we'd like to point out to the Conference of Christians and Jews that the oil industry probably operates with more people of wide differences in race, religion, and culture than any other industry in the world and does it efficiently. We've never been able to define "class" to our satisfaction, so we'll leave that difference out.

1956 Was Good Financial Year

In addition to the companies reported last month, we have received additional 1956 financial reports. On the whole oil companies made good gains in 1956 over 1955. Below are some reports received since last month.

Sun Oil Company had a gross income of $734,000,000 compared to $664,000,000 in 1955, an 11 percent increase. Net income was $56,000,000 in 1956 compared to $48,000,000 the year before, or 16 percent higher.

Atlantic Refining Company's 1956 net profit showed a gain of 20 percent. Sales and other operating revenues advanced 6.2 percent over 1955. Net income reached $47,000,000 compared to $39,000,000 in 1955.

Merrill Petroleums, Ltd. (Canada) estimates its 1956 cash flow — revenue less operating cost, but before depreciation and depletion — at $4,700,000. This is up 175 percent from 1955. The company has a minimum budget of $1,000,000 for exploration.

Standard Oil Company of Ohio had sales and operating revenues of $392,500,000 in 1956 compared with $367,000,000 in 1955. Net profit in 1956 was $26,500,000 compared to $23,000,000 in 1955. The 1955 net income includes a profit of $2,235,651 from liquidation of two affiliated companies.

Wilcox Oil Company released its 39th Annual Report as of December 31, 1956. Gross income was $8,611,000 compared to $8,258,000 the previous year. Net income was lower — $783,000 in 1956 compared to $982,000 in 1955.

Phillips Petroleum Company reported total income of $760,000,000 for the nine months ending September 30, 1956 and a net income of $71,570,000. This compared with a total income of $660,000,000 for the same period of 1955, and a net income of $65,189,000.

Bishop Oil Company reported a slight loss in its net income of $435,555 compared to $534,093 in 1955. Gross income was up over the previous year — $2,850,505 as against $2,362,564.

Douglas Oil Company for the first nine months of fiscal 1956 — that is April 1 to December 31 — had net sales of $22,380,457 last year compared to $17,790,366 the previous year. Profits showed over 100 percent gain. In 1956 they were $585,915 and the year before $257,101.

Texas Gulf Producing reported $16,732,000 gross operating income in 1956 compared to $16,077,000 for 1955. Net profit, however, was lower. In 1956 it was $5,657,708 and $6,320,029 in 1955.

Shamrock Oil and Gas Corporation, which has a fiscal year ending November 30, reported gross operating income of $52,519,000 in 1956 and $43,180,000 in 1955. Net income was $9,007,312 in 1956 compared to $7,755,714 the previous year.

Ohio Oil Company showed a preliminary net income for 1956 of $41,215,655 which compares with the net income in 1955 of $41,255,462, virtually no change.

Why Wages Rise

At last we have an analysis of wage gains undertaken by a sound economist and written so the layman can understand his thorough study. F. A. Harper, the author, notes in his introduction that there is evidence aplenty that the economic principles which apply to wage problems are not well understood. He deals with two important problems relative to wages. One is the difference between money wages and real wages, which so often results in serious misconceptions. For instance, a comparison of money wages in two years — one of inflation and one of deflation — tells no more about their relative worth than when a comparison of a daily wage in the United States is made of that of Chile.

Another aspect is the effect of unions on wages. He points out that there seems to be a firm and widespread belief that unions affect wages, but Mr. Harper has very clear argument that wage rates show no clear response whatever to changes in union membership.

This is one book on economics that will be easy to read and represents "must" reading for management. ("Why Wages Rise," by F. A. Harper, published by the Foundation for Economic Education, Inc., Irvington-on-Hudson, New York, 124 pages, price $1.50.)

Excellent Management

Twenty-eight companies — integrated petroleum companies and gas transmission companies — this year received the mark of good management certificate from the American Institute of Management. This was in recognition of distinguished accomplishment in the 10 categories of the management audit, which is described on page E-5 in this issue.

It is interesting to read and understand the basic functions which are considered necessary for excellent management.

Canadian Oil Investments

When one of the clients of John S. Herold, Inc. made a special report on Canadian oil companies for investment the report was undertaken with the agreement that the material could be released after 30 days on an unrestricted basis. This volume is the result. Although many of the market prices given here are changed and, of course, are always changing, the background material is still pertinent and will be valuable in any appraisal of Canadian stocks.

Besides general tables on Canadian and U.S. oil companies, there is a 30-company summary and detailed analysis of these 30. Financial and operating data, as well as general comments of the companies are included.

Canadian Oil Companies for Investment, published by John S. Herold, Inc., 250 Park Avenue, New York 17, New York, 62 pp, price $40.

HIGHLIGHTS ★ ★ ★

Digest of News and Comment

Three 65,000-ton tankers have been ordered by the Cities Service Company from a Swedish shipyard, first such order placed by the company outside the U. S. Total cost is about $34,000,000, with a delivery date of June, 1959. Board Chairman W. Alton Jones indicates that the three 816-ft-long vessels will probably fly the Liberian flag.

★ ★ ★

Argentina's big need is oil. Imports into that country are more than $200,000,000 annually in hard-currency exchange. Higher oil and tanker freight costs resulting from the Suez situation is expected to bring the bill up as much as $50 to $100 million higher. The state oil monopoly has managed to contract for half of Kuwait crude it will need this year. Argentina's domestic oil production development is also lagging, as is a plan calling for additional pipelines to remedy serious field to market situation.

★ ★ ★

Radiation-resistant oils pre-sent a new kink to those who would make this an atomic age. Oil industry scientists are working on experiments to perfect lubes that will not turn to crusty, hard masses when exposed to radiation. Much progress has been made, however, by scientists at the California Research Corporation, a subsidiary of Standard Oil of California. This group developed oils used on the atomic submarine U. S. S. Nautilus. Although much information on the project is being withheld, officials of the project say they "are keeping pace with present needs" in this field.

★ ★ ★

Louisiana oil allowables re-main unchanged this month, in spite of "outside pressures," Conservation Commissioner John B. Hussey has declared. A 10,000 bbl per day allotment for oil production of new wells marks the only increase. February production rate was 982,453 bbl per day.

★ ★ ★

Oil loading records have been broken by the Baytown, Texas, refinery docks of Humble Oil & Refining Company. More than 9,348,500 bbl of crude and products were loaded into 71 tankers and 124 barges in the month of January. About 2,200,000 bbl was crude, the rest, refined products. This broke the previous record made one month earlier when 9,205,000 bbl of oil and products were moved from the same docks.

Colorado's severance tax on oil and gas production has been attacked in district court by the California Company. This firm is the first to carry fight against the tax to the courts. More than $10,000,000 has been paid by oil companies into the state treasury since the tax was enacted in 1953. Company attorneys contend the tax on production denies the company "equal protection under the law" by assessing the tax under an arbitrary and discriminatory classification.

★ ★ ★

Wage increases have been granted to 1000 non-union employees at home offices in Chicago of Standard Oil Company (Indiana). Officials have also authorized managers in 15 midwestern states to grant the same increase, amounting to 3 percent of present salaries, to non-represented workers. All union employees who are now negotiating for new contracts are being made the same offer.

★ ★ ★

Television is the newest public relation media being explored by Atlantic Refining Company. Oil's role of science and research is being told to thousands of Philadelphia, Pennsylvania, high school students through a weekly television "Advanced Science" program. Dr. Vincent Keenan of the company's research labs demonstrated for the students latest techniques being used in the exploration for oil. Atlantic will present another of these programs this spring, telling the story of "Science in Refining."

★ ★ ★

Surprise steel price hike on oil country goods was made in mid-February. Range of the increases were from $6 to $9 per ton on various size pipe, averaging 3½ to 4 percent across the board. The increase was expected by most oilmen in July. Leaders of nearly all oil associations have hit the increase, the sixth since June 15, 1953.

★ ★ ★

Availability of trained man-power will have the greatest effect on long economic prospects of Canada, according to a comprehensive report recently prepared by a Royal Commission. The report predicts a 1980 Canadian population of 26,650,000, compared to 16,000,000 at present. Gas production in this period will increase 15 times, and oil output will be raised 10-fold. Gross national product may attain $85 million in terms of 1955 dollars; it was $29.5 billion in 1956.

Tax depletion allowance cut-ting legislation was, as usual, among the first to be submitted to Congress. Representative Heselton, Massachusetts Republican, submitted a bill early in February to trim the allowance from the existing 27½ percent to 15 percent. Heselton has entered similar bills in earlier sessions and is currently submitting a bill to provide a continuing study by the U. S. Attorney General of the Interstate Oil Compact Commission. Favorable natural gas legislation for "most" natural gas producers has been introduced by Senator Estes Kefauver, Democrat of Tennessee. This bill would exempt most producers from federal price regulation.

★ ★ ★

Office of Defense Mobilization will be led by Gordon Gray, a North Carolina Democrat. Resignation of Arthur S. Flemming as director of the ODM was accepted early in February by President Eisenhower. Gray was secretary of the Army in the Truman administration, and has been assistant secretary of defense for international security affairs since July 1, 1955. Flemming will return to the presidency of Ohio Wesleyan University, from which he has been on leave for almost four years.

★ ★ ★

No more oil drilling for the Navy — on San Nicholas Island, California, or any other lands not specifically designated as naval petroleum reserves — is the intent of a bill proposed by the House interior and insular affairs committee. Decision to draw definite boundaries around the Navy's oil drilling aspirations came after a recent verbal "tangle" between Committee Chairman Clair Engle, Democrat of California, and top officials of the Office of Naval Petroleum Reserves. Arguments arose out of the Navy's insistant demand that it still has right to drill on San Nicholas Island.

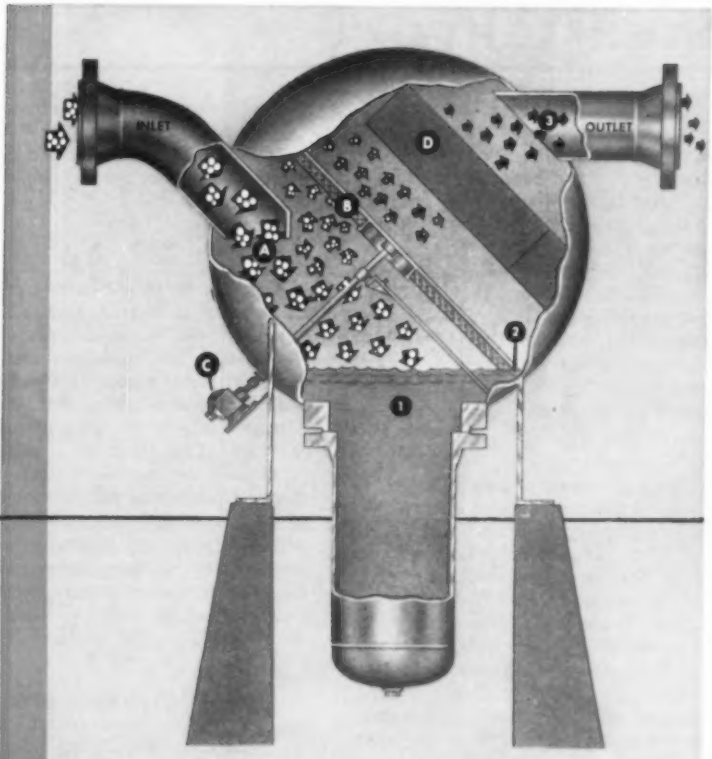
★ ★ ★

Supplier-sponsored parties and entertainment at annual meetings of the American Association of Oilwell Drilling Contractors has been eliminated by the group's board of directors. The move was made to assist suppliers in reducing sales expense, according to E. Dale Mount, chairman of the AAODC public relations committee. In the future, all social functions will be sponsored by the AAODC.

MORE EFFICIENT RESULTS!

PEERLESS SCRUBOSPHERE*

*Spherical scrubber for dust and liquid removal from gas flow

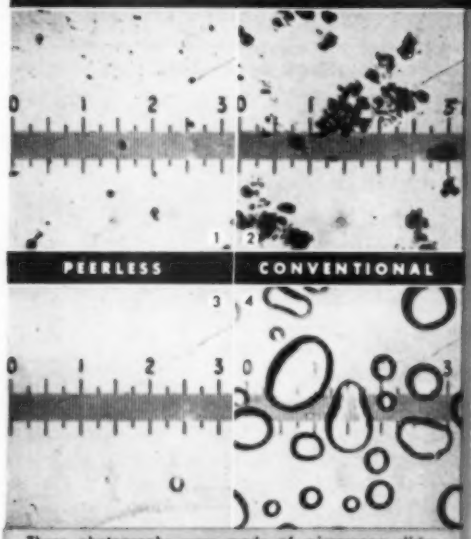


(A) The majority of incoming liquid and solid particles are directed down into reservoir. 1

(B) Lighter solid particles carried by gas stream are separated on surfaces of contactor which are kept wet and clean by revolving through liquid reservoir. 2

(C) Contactor is revolved by explosion-proof gear motor.

(D) Mist Extractor removes any remaining liquid particles from gas stream prior to outlet. 3



These photographs were made of microscope slides introduced downstream of the Scrubosphere and a conventional vertical oil bath cleaner under the same operating conditions. Plates 1 and 2 show the comparative amounts of iron oxide not removed with the amounts introduced being identical. Plates 3 and 4 indicate comparative oil loss with vapor rate through the vessels being the same.

LOOK AT THIS TEST The test at the left indicates the superiority of Peerless Scrubosphere over conventional oil bath dust scrubbers. The SCRUBOSPHERE operates with no loss of efficiency at low flows, minimum liquid loss, and very low pressure drop. Other outstanding features include easy vessel access with removable self-cleaning contactor, a sump for slugs of solid or liquid particles, and minimum cost.

For detailed information write for Bulletin No. 180

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PEERLESS MFG. CO. DALLAS TEXAS

Compromise proposal to mod- ify federal natural gas controls, drawn up in Dallas, Texas, in a February meeting of a combined producer-pipeline-distributor group, drew little official comment from producer organizations. The planning group, which included about 50 gas producers, focused attention on cutting red tape and providing a better basis for federal price-fixing. President Eisenhower has indicated that he still supports the basic objectives of the Harris-Fulbright Bill, which he vetoed last year.

★ ★ ★

Experimental car testing is underway in San Francisco, California, in a fleet of experimental cars powered by 12:1 ratio high-compression engines. Standard Oil Company of California reports the cars are using new motor oils and will consume 50,000 gal of specially prepared 100-plus octane gasolines. At the same time indoor tests are being made, simulating all speed, weather and load conditions, in efforts to determine fuel and lubricant needs of "engines of tomorrow."

★ ★ ★

A $150,000,000 damage suit has been filed by Sun Oil Company against Stavros S. Niarchos, a Greek citizen, and World Tankers Corporation, organized under laws of Liberia. Sun claims that a contract was broken that provided ocean transportation for 33,200 bbl of crude daily between the Middle East and Marcus Hook, Pennsylvania. Sun indicated that the defendents refused to provide the transportation called for.

★ ★ ★

Texas Railroad Commission increased March oil allowables to a new record high, linking the hike to the Europe oil lift. Texas wells are producing at an allowable rate of 3,733,054 bbl daily on an 18-day pattern. This matched the highest request by any purchasing company, in sharp contrast to previous monthly quotas set 1 to 3 days below purchasers' recommendations.

★ ★ ★

"Alleged deficiencies in the Oil-for-Europe program are being used as a stick to beat the petroleum industry," API President Frank M. Porter made it plain recently. In striking back at oil opponents who have relentlessly attacked the industry throughout the Middle East crisis, Porter declared that Western Europe has been saved from its most serious fuel crisis in history by emergency action "of unparalleled magnitude," and indicated that Europe is receiving nearly 90 percent of normal product needs.

★ ★ ★

Oil can form rapidly, by geo- logic standards, finds Dr. Carter L. Kidwell, Carter Oil Company, after a detailed study of some sediments in northeastern Venezuela. Geologists have in the past talked of the formation of crude oil in terms of millions of years, rather than in a period of 5000 years or less, as Kidwell found through analysis of radioactive material found in a lenticular sand at a depth of 115 ft. Results of this work is being presented at the annual convention of the American Association of Petroleum Geologists, April 1-4.

★ ★ ★

Sale of Alabama offshore leases in the Mississippi sound, held recently by state officials, has been challenged by the Department of Interior. Federal Government contends the state did not have authority to sell the leases, since they lie outside the three-mile limit. The oil and gas leases involved 232,000 acres and were sold to the Tidelands Development Corporation for 50 cents an acre.

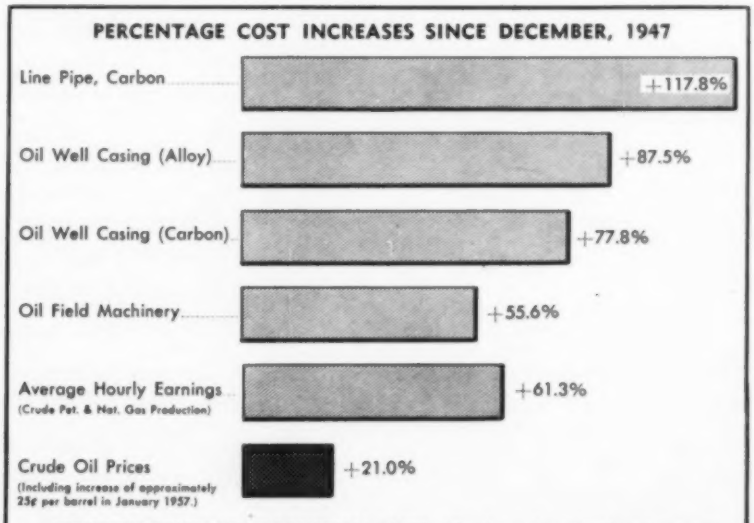
Total oil demand will drop some 250,000 bbl daily in the February to April period from that of the last three months. According to the IPAA Supply and Demand Outlook, demand for this quarterly period will be 10,255,000 bbl daily. Of this total amount, imports are expected to average 1,375,000 bbl daily.

★ ★ ★

New Mexico and Kansas are holding March allowable figures to February rates, with some gains permitted to give outlet to newly completed wells. New Mexico has held its allowable to 43 bbl daily per basic unit for a permissible daily flow of 328,663 bbl, including production from new wells. Kansas, which set a record in February, is permitting the same flow to continue in March.

★ ★ ★

Coal interests foresee the re- turn of lost fuel markets as a result of increased oil prices. Bituminous Coal Institute, organized late last year to minimize heavy losses incurred by oil and gas conversions, sees a real opportunity to regain oil business, although spokesmen will not admit elation over governmental concern being given the price rises. The BCI says its engineers are "ready to show that coal is much cheaper than any other fuel."



CRUDE OIL PRICES VS. PRODUCTION COSTS—The above chart, based on government statistics, shows crude oil prices have lagged far behind rising production costs. Since December 1947, crude oil prices have risen only 21 percent (including the increase of less than 10 percent last month). Yet, the major elements of production costs have increased an average of 80 percent in the same period. Percentagewise, the oil producers' costs have increased almost four times as much as the income he gets from his crude oil sales. *(Prepared by the Independent Petroleum Association of America from U. S. Bureau of Labor Statistics data).*

Good Wells Make Good News

Which well treatment pays out fastest? There is no single answer to that question. The type of formation, character of the produced fluid, type of completion, market conditions and allowables all enter into the problem. Regardless of the factors contributing to payout time, however, Dowell can tailor a treatment for optimum return. Here are some examples.

- ***Fort Bend County, South Texas*** – (Old well) Thompson Field. Production had declined to one barrel of oil per day. Allowable was 44 barrels. Operator suspected emulsion or water block. Dowell recommended Formation Cleaner treatment using a special Dowell de-emulsifying agent in 1000 gallons of lease oil. Total treatment cost was only $300 and well was restored to its allowable. ***Treatment paid for itself in less than four producing days.***

- ***Hamilton County, Illinois*** – (New well) Completed in Aux Vases sandstone (permeability 70 millidarcys) at 3145-3159 feet. Dowell treated the well with Petrojel*, using 20,000 gallons of fluid (one pound sand per gallon), and a 500-gallon Mud Acid spearhead. Injection rate was 52 barrels per minute at 1100 pounds per square inch. Production after treatment was 80 barrels of oil per hour. After 15 days, well was flowing 300 barrels of oil per day. At two dollars per barrel, ***$3,555.50 treatment would pay out in less than one week!***

- ***Weld County, Colorado*** – (Old well) The Campbell #2, completed in the dirty, shaley, Dakota "J" Sand of the Roggen Pool, had declined in production to 30 barrels of oil per day. Allowable was 40 barrels. Since operator could profit from only 10 barrels daily of any production increase, an inexpensive treatment was indicated. Dowell gave the well an $843 Mud Acid treatment which boosted production to 70 barrels of oil per day. ***In spite of the fact that the net production gain was low, this treatment paid for itself in only six weeks.***

- ***Beckham County, Oklahoma*** – (New well) Production of gas well completed in dense and tight Brown dolomite was a noncommercial 200,000 cubic feet per day. Treated with Riverfrac*, using 30,000 gallons of water with 1 pound of sand per gallon, and a spearhead of 1,000 gallons of Dowell Intensified Acid. Production stabilized at 2,500,000 cubic feet per day. ***At contract prices, $3,700 treatment was paid out in less than 20 days.***

Whatever treatment your well requires, you can get it from Dowell. Good equipment, experienced operators, and the widest selection of fracturing and acidizing techniques enable Dowell to tailor the job to fit your requirements. For more information or service, call any of the 165 Dowell Offices in the United States and Canada; in Venezuela, contact United Oil Well Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma.

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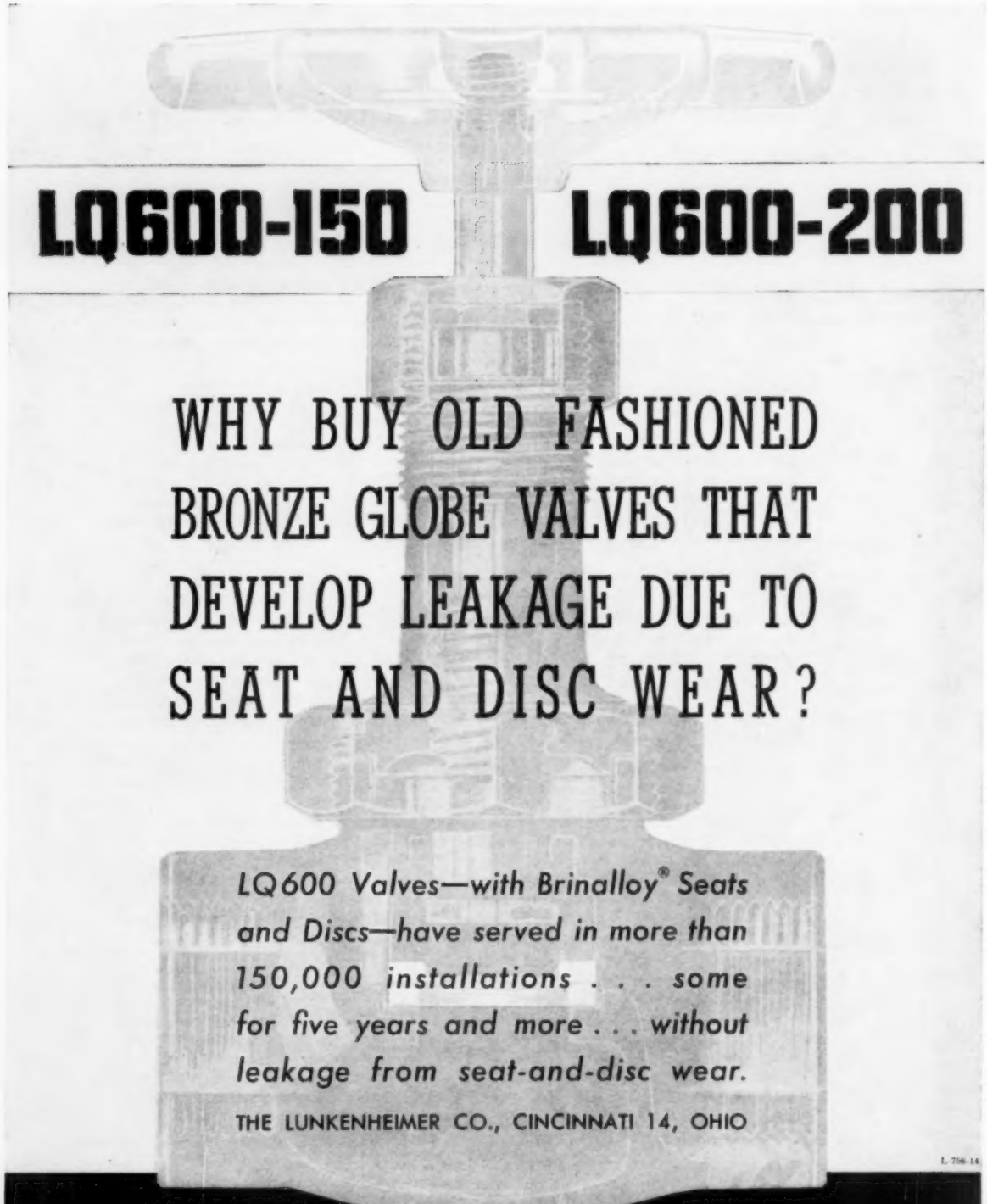

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Meetings

March 3-6—**American Institute of Chemical Engineers,** Greenbrier Hotel, White Sulphur Springs, Virginia.

March 6-8—**API Division of Production,** southwestern district, Statler Hilton Hotel, Dallas, Texas.

March 10-16—**Engineers Joint Council,** second nuclear engineering and science congress, Convention Hall, Philadelphia, Pennsylvania.

March 11-15—**NACE,** 13th annual conference and exhibition, Kiel Auditorium, St. Louis, Missouri.

March 18-19—**Steel Founders' Society of America,** 55th annual meeting, Drake Hotel, Chicago, Illinois.

March 18-21—**Society of the Plastics Industry, Inc.,** annual national conference and Pacific Coast exposition, Hotel Biltmore, Los Angeles, California.

March 20-22—**API Division of Production,** southern district meeting, Washington Youree and Captain Shreve hotels, Shreveport, Louisiana.

March 25-27—**Western Petroleum Refiners Association,** 45th annual meeting, Hilton Hotel, San Antonio, Texas.

March 25-29—**10th Western Metal Congress,** Ambassador Hotel, Los Angeles, California.

March 27-29—**American Power Conference,** Sherman Hotel, Chicago, Illinois.

March 30—**North Texas Oil and Gas Association,** 27th annual meeting, Kemp Hotel, Wichita Falls, Texas.

April 1-4—**AAPG,** national convention, Kiel Auditorium, St. Louis, Missouri.

April 2-4—**Corrosion Control Short Course,** sponsored by Central Oklahoma Section of NACE and University of Oklahoma, University of Oklahoma Extension Study Center, Norman, Oklahoma.

April 5-6—**AIME,** Pacific Southwest Mineral Industry conference, Reno, Nevada.

April 7-10—**ASME,** Instrument & Regulators Conference, Northwestern University, Chicago, Illinois.

April 7-12—**American Chemical Society,** 131st national meeting, Miami, Florida.

April 8-9—**Industrial Accident Prevention Association,** annual conference, Royal York Hotel, Toronto, Canada.

April 8-10—**ASME,** spring meeting, Dinkler-Tutwiler Hotel, Birmingham, Alabama.

April 8-10—**AIME,** open hearth and blast furnace conference, William Penn Hotel, Pittsburg, Pennsylvania.

April 8-12—**American Welding Society,** Sheraton and Bellevue Stratford hotels, Philadelphia, Pennsylvania.

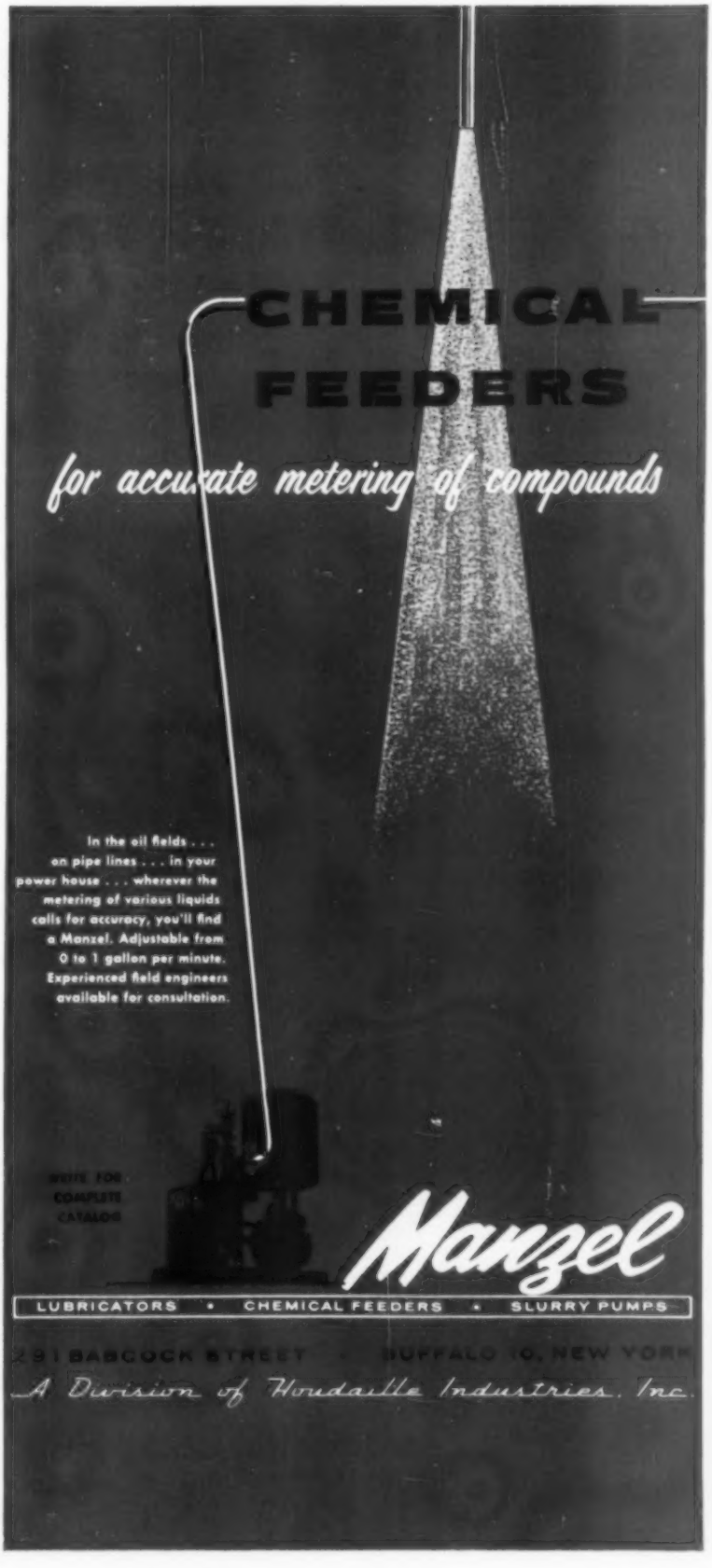
April 9—**AIChE, Philadelphia-Wilmington section,** one-day meeting, University of Pennsylvania Museum, Pennsylvania.

April 10-12—**National Nuclear Instrumentation Conference,** Atlanta, Georgia.

April 10-12—**API Division of Production,** Mid-Continent district meeting, Mayo Hotel, Tulsa, Oklahoma.

April 11-13—**AIME,** Pacific Northwest regional conference, Portland, Oregon.

April 16-17—**National Petroleum Association,** 54th semi-annual meeting, Cleveland Hotel, Cleveland, Ohio.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April 16-18—**Petroleum Industry Electrical Association and Petroleum Electric Supply Association,** 29th annual conference and exhibits, Shamrock-Hilton Hotel, Houston, Texas.

April 18-19—**Permian Basin Oil Recovery Conference,** sponsored by AIME and Texas Petroleum Research Committee, Midland, Texas.

April 22-25—**Canadian Institute of Mining & Metallurgy,** annual general meeting, Chateau Laurier, Ottawa, Ontario, Canada.

April 24-26—**API Division of Production,** Rocky Mountain district meeting, Gladstone, Townsend, and Henning hotels, Casper Wyoming.

April 24-26—**Natural Gasoline Association of America,** 36th annual convention, Rice Hotel, Houston, Texas.

April 25-26—**API Board of Directors,** Dallas, Texas.

April 28-30—**Independent Petroleum Association of America,** midyear meeting, Buena Vista Hotel, Biloxi, Mississippi.

April 29-May 1—**Southern Gas Association,** New Orleans, Louisiana.

May 1—**American Oil Chemists' Society,** annual meeting, Roosevelt Hotel, New Orleans, Louisiana.

May 1-3—**API Division of Production,** Eastern district meeting, William Penn Hotel, Pittsburgh, Pennsylvania.

May 6-8—**API,** annual pipe line conference, Cleveland Hotel, Cleveland, Ohio.

May 6-8—**American Geophysical Union,** 38th annual meeting, National Academy of Sciences, Washington.

May 13-15—**12th Purdue Industrial Waste Conference,** Purdue Memorial Union Building, Purdue University, Lafayette, Indiana.

May 13-16—**API Division of Refining,** midyear meeting, Penn-Sheraton Hotel, Philadelphia, Pennsylvania.

May 16-17—**API Division of Production,** Pacific Coast district, Biltmore Hotel, Los Angeles, California.

May 19-22—**Texas Independent Producers and Royalty Owners Association,** 11th annual membership meeting, Galvez and Buccaneer hotels, Galveston, Texas.

May 19-23—**ASME,** Oil and Gas Power Conference, Kentucky Hotel, Louisville, Kentucky.

May 20-24—**American Society for Testing Materials,** 5th conference on Mass Spectrometry, Commodore Hotel, New York City.

May 23-24—**AIME Petroleum Branch,** 3rd annual joint meeting, Rocky Mountain Petroleum sections, Northern Hotel, Billings, Montana.

May 27-29—**Rocky Mountain Oil & Gas Association,** Cosmopolitan Hotel, Denver, Colorado.

May 29-31—**12th Annual Short Course in Gas Technology,** Texas College of Arts and Industries, Kingsville, Texas.

June 2-7—**SAE,** summer meeting, Chalfonte-Haddon Hall, Atlantic City, New Jersey.

June 4-6—**Appalachian Underground Corrosion Short Course,** Morgantown, West Virginia.

June 6—**Pennsylvania Grade Crude Oil Association,** 34th annual meeting, Penn-Sheraton Hotel, Pittsburgh, Pennsylvania.

June 9-14—**API Division of Production,** midyear committee conference, Muehlbach Hotel, Kansas City, Missouri.

June 10-12—**Interstate Oil Compact Commission,** midyear meeting, Canyon Hotel, Yellowstone National Park, Wyoming.

June 24-28—**American Institute of Electrical Engineers,** 1957 summer general, Sheraton-Mt. Royal Hotel, Montreal, Quebec, Canada.

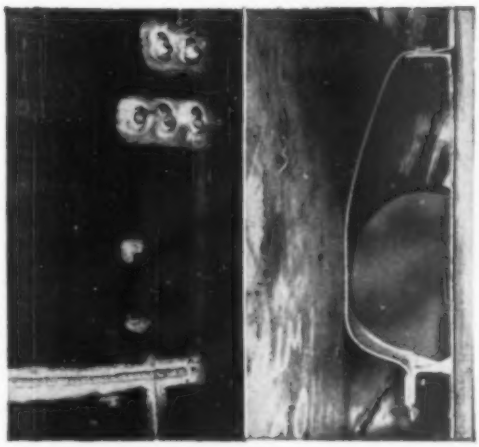
exhaustive tests prove: **36 YEARS FROM TODAY**

TUBESEALS* NOW IN FLOATING ROOF TANKS WILL OPERATE AS EFFICIENTLY AS THEY DO TODAY!

WE DOUBT this can be claimed for any other floating roof seal!

To determine the efficient life-expectancy of the Hammond Tubeseal in service, tests were made under the worst possible conditions to which a floating roof seal can be subjected. The Tubeseal was moved across very rough rivet heads, erection burrs and abrasive weld surfaces, for a total travel of 70,000 feet. This is equivalent to a normal wear of *more than 36 years in actual service.* Moreover, as the tests were run dry, there was the added disadvantage of the absence of lubricating effect normally created by wetted surfaces. Upon completion of these rigorous tests, the scuff band had only worn through the ribs and had barely penetrated through the material, leaving two-thirds of the stock intact; proof that the Tubeseal is unimpaired after traveling 70,000 feet.

The 36 year life-expectancy of a Hammond Tubeseal assumes no mechanical accident and is arrived at in the following manner: Each year a floating roof, in normal service, makes about 48 trips to and from top and bottom of tank. The roof of a 40 foot tank, therefore, will travel 1920 feet per year. Assuming 1920 feet of travel per year (based upon full depth of travel) and applying our accelerated wear test, the Tubeseal will be serviceable for at least 36 years 5½ months.



THE TUBESEAL TEST:

total travel	70,000 feet
travel over vertical weld	46,400 feet (on same line)
Horizontal welded seam crossed	21,200 times
Flat head rivets crossed	63,600 times

CONDITION OF TUBESEAL AFTER TEST: Scuff band had worn through ribs and had barely penetrated into the main material, leaving ⅔ of stock intact.

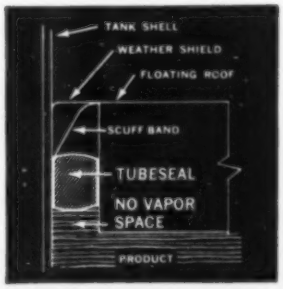
Tests were conducted dry with no aid of lubricant normally resulting from stored product.

Photos show projections used for test. Included are 16"of ⅜" horizontal weld—24" of sharp, irregular vertical weld—2 erection burrs—3 ¾" flat head rivets and 2 ¾" cone head rivets.

THE HAMMOND TUBESEAL
is the most efficient and positive seal known.

it features:

no moving parts
no mechanical maintenance
climate proof
non-corrodible
can operate to bottom of tank or above the top
no vapor space below the seal
entire circumference has tight seal under pressure at all times
longer working life expectancy



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NO EVAPORATION
NO CORROSION

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MEAN ELECTRIC WELD LINE PIPE PROVEN AND READY FOR OIL AND GAS PRODUCING AREAS

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1. It bends readily
2. Wall thickness is uniform
3. Line up characteristics are excellent
4. Weldability is outstanding
5. Long lengths save you time and trouble

In the process of producing Youngstown Electric Weld Line Pipe, every means is explored to assure uniform wall thickness. Uniformity of wall in the pipe begins with control of the skelp thickness produced on the rolling mill. The experience plus control in the rolling of the skelp by men who know steel makes this uniformity possible. Youngstown as an integrated producer has full control over the skelp rolling as well as the finished pipe production. To test the uniformity and quality, the pipe is then placed in a hydrostatic testing machine where internal pressure is applied. To obtain Electric Weld line pipe of uniform wall thickness—specify Youngstown Electric Weld line pipe for your next pipe line job.

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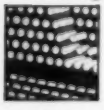
"...used by more drillers on more mud pumps than any other V-belt made"

4 engineering features make Rib-Top world leader

You save money... save time... when you order Gates V-Belts — developed *specifically for mud pump drives.*

In oil fields around the world, drillers reduce the work delays and costs due to belt replacement, by using Gates Rib-Top with these four important features:—

1. Tougher, More Resilient Tensile Cords.



Enable Rib-Top V-Belts to absorb severe pulsations of the mud pump—easily handle peak loads.

2. Concave Sidewalls (U.S. Pat. No. 1813698).

Provide sure pulling power, less wear, longer V-belt life, because as belt bends around a sheave, concave sides fill out...become straight ...fit sheave grooves evenly (Fig. 1). Straight-sided belts bulge at the sides when bent. Uneven contact (Fig. 2) causes uneven wear, shorter belt life.

3. Stabilizing Ribbed Top (U.S. Pat. No. 2548135).

Dampens vibration ... protects top of belt against damage ... keeps belt running smoothly over idler-equipped mud pump drives, with no side whip.

4. Flex-Weave Cover (U.S. Pat. No. 2519590).

Insures greater flexibility with far less stress on fabric. Wears longer ... increases belt life ... lowers belt costs ... makes more power available to driven machine.

You pay no more for Rib-Tops than for ordinary belts of comparable ratings. Both Standard and Super Rib-Top V-belts are available from your oil supply house. Specify Gates Rib-Top next time you order. The Gates Rubber Co., Denver, Colorado—*World's Largest Maker of V-Belts.*

For Toughest Drives Use *Super* Rib-Top

40% greater horsepower capacity. Handles drive overloads and shock loads easily. Increased capacity solves weight and space problems by permitting narrower sheaves and fewer belts.

Gates

The Mark of Specialized Research

TPA 92

Gates Rib-Top Vulco Rope

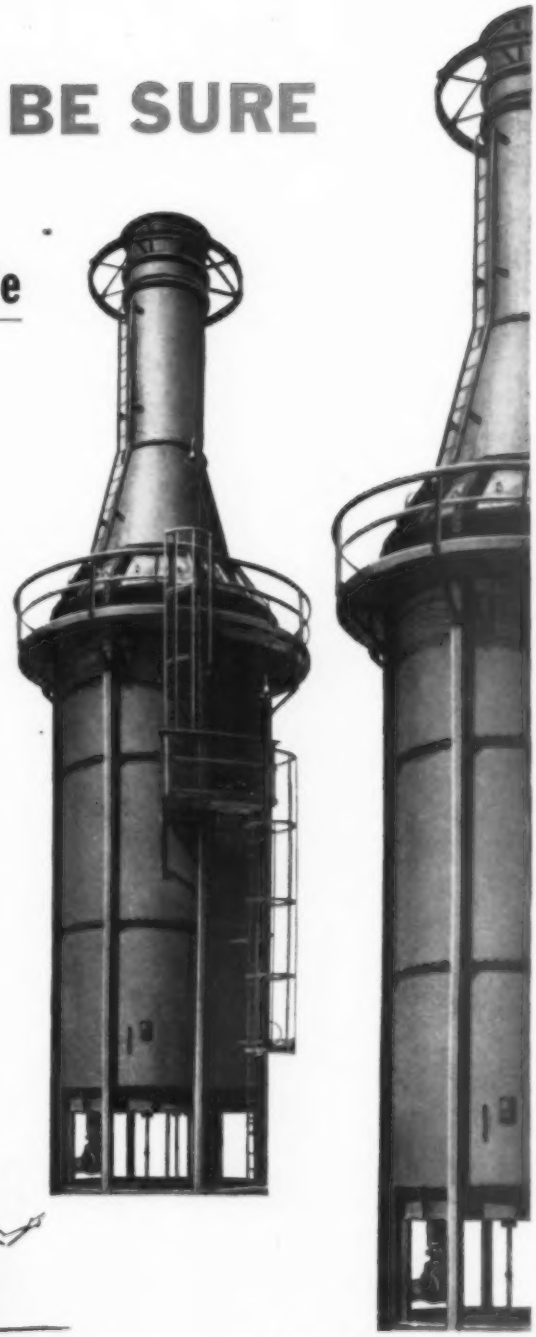
DEVELOPED ESPECIALLY FOR MUD PUMP DRIVES

YOU, too, CAN BE SURE

petrochem-isoflow furnaces

are most economically desirable

by any comparison



Whenever *all* the specifications and *all* the operating requirements are applied to direct-fired furnace design, you can be sure PETROCHEM-ISOFLOW FURNACES will be found most economically desirable, by any comparison.

In making comparisons it is essential to take these factors into consideration:

1—Average radiant transfer rate.
2—Maximum deviation from average radiant transfer rate.
3—Average and maximum transfer rate in convection section.
4—Maximum tube wall temperature, radiant or convection.
5—Maximum efficiency with specified excess air.
6—Controlled thermal recirculation of flue gases to provide even heat distribution throughout full length of each tube and equalized heat distribution around each tube.
7—Overload and corresponding transfer load.
8—Design to provide: structural column supports—Ladders—Platforms—Tube Removal facilities, etc.
9—Degree of assembly; of the furnace structure and of the heating surface.

When you specify PETROCHEM-ISOFLOW FURNACES . . . you'll be in good company. More than 1500 are now in service, performing to the complete satisfaction of their operators and usually well beyond their rated capacities.

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Roebling Royal Blue Wire Rope will take **shock** after **shock** after **shock!**

This, and the fact that Royal Blue is stronger than the strongest you have been using, has helped to make it the most widely favored rope in Roebling's history. It will work hard and last longer on *your* job. Your distributor or Roebling Sales Office will give you full information, or write: John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

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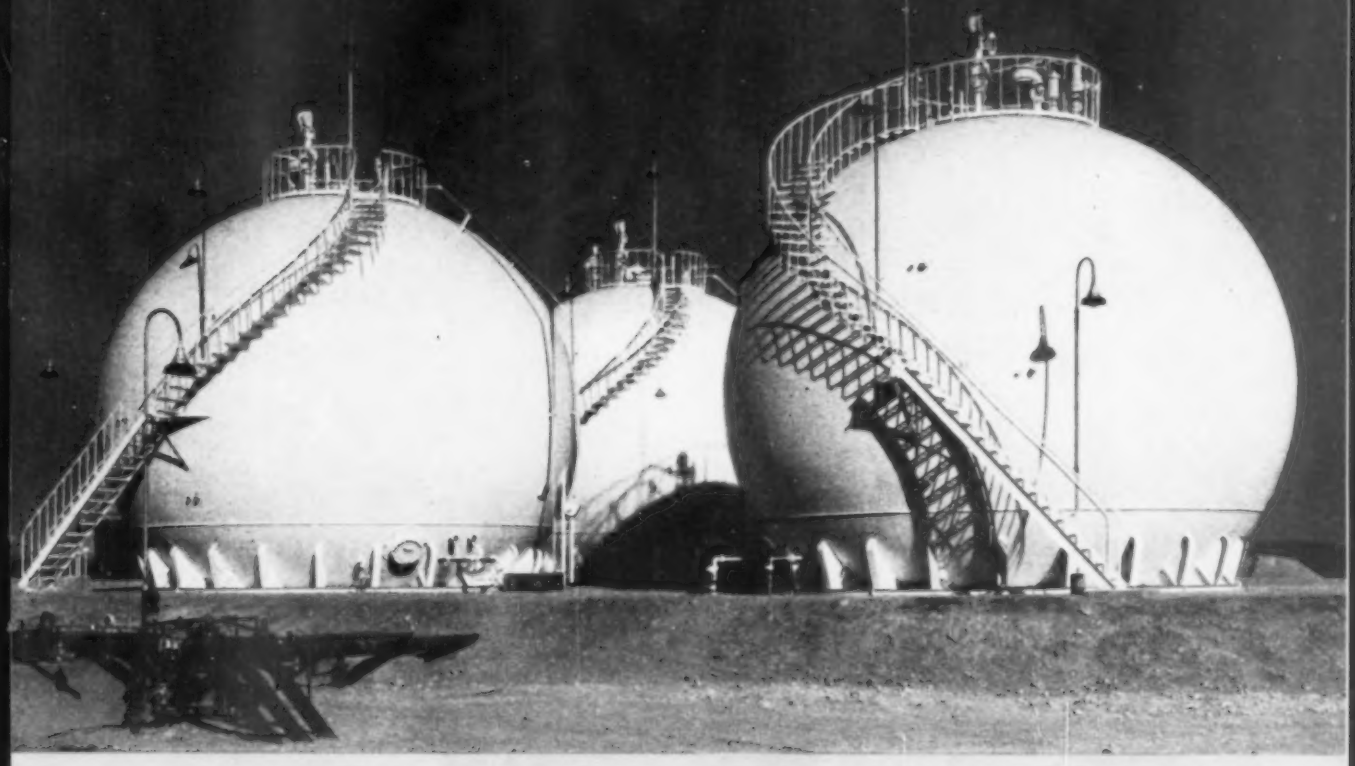
HORTONSPHEROIDS...

the natural way to store natural gasoline and stop evaporation loss



Hortonspheroids® are used to store liquids that are too volatile to hold at atmospheric pressure. They prevent breathing and boiling losses and reduce filling losses to a practical minimum. No vapor can be lost as long as the internal pressure does not exceed the settings of the pressure relief valves.

The three 3,500-bbl. Hortonspheroids above were erected for the storage of natural gasoline at the Texas Natural Gasoline Corporation, Perkin's Plant, Coke County, Texas. They are designed for 45 lbs. per sq. in. working pressure and were pickled and painted by the Horton® Pickling Process, an efficient means of removing mill scale from steel to provide a better bond between paint and metal.

Hortonspheroids are built in capacities to 120,000 bbls. and for pressures to 100 lbs. per sq. in. in smaller sizes. For further information please write our nearest office.

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Above: Three 3,500-bbl. Hortonspheroids, built by CB&I for the Texas Natural Gasoline Corporation, Perkin's Plant, Coke County, Texas. The structures are 35 ft. in diam. and were designed for a working pressure of 45 lbs. per sq. in.

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Shops than From any
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There is no substitute for forged alloy steel
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MANUFACTURERS AND ERECTORS SINCE 1913

FLOW BEAN CAPACITY CHART

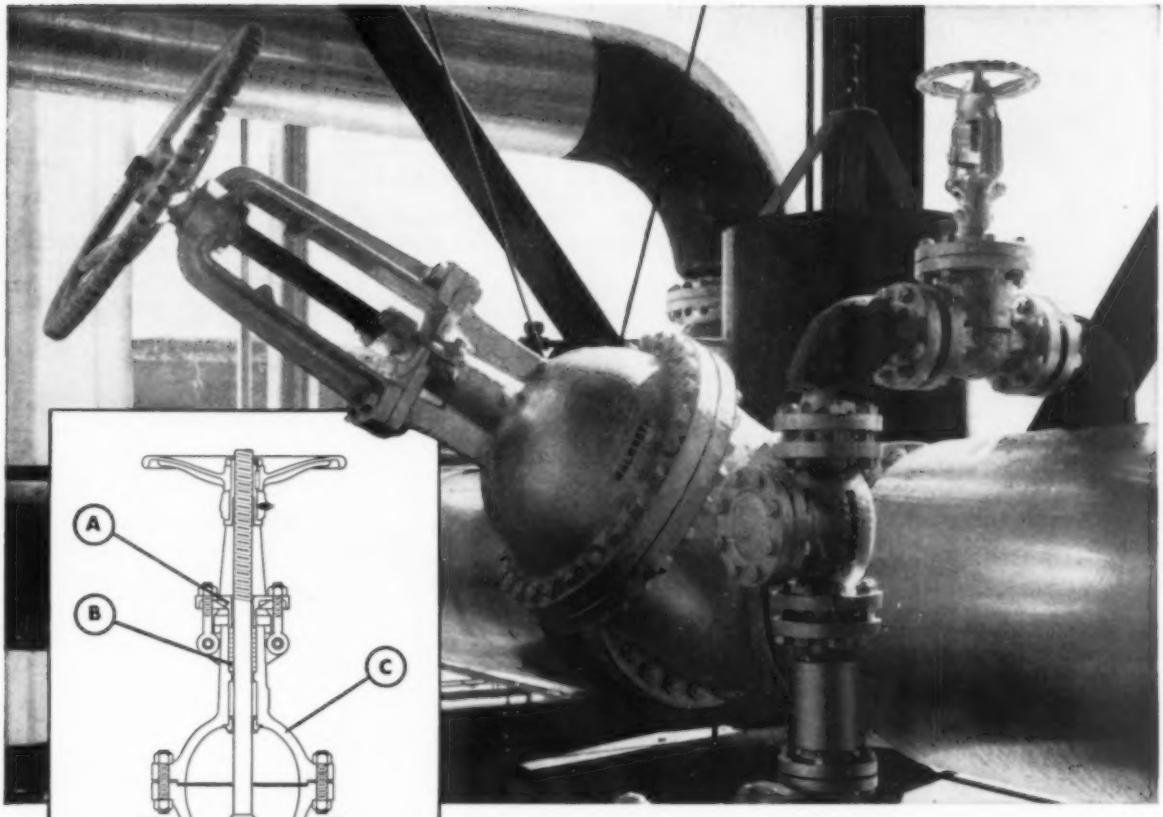
Barrels per day	Gallons per minute	Flow beam diameter required, inches	Stock size diameter, inches
25	0.729	0.05646	0.0625 — 1/16
50	1.457	0.0798	0.078125 — 5/64
75	2.186	0.09775	0.09375 — 3/32
100	2.915	0.1125	0.109375 — 7/64
125	3.646	0.1263	0.125 — 1/8
150	4.374	0.1383	
175	5.105	0.1494	
200	5.833	0.1596	0.15625 — 5/32
225	6.565	0.1694	
250	7.290	0.1785	
275	8.020	0.1871	0.1875 — 3/16
300	8.748	0.1954	
325	9.475	0.2034	
350	10.21	0.2112	
375	10.93	0.2184	0.21875 — 7/32
400	11.66	0.2256	
425	12.38	0.2327	
450	13.12	0.2394	
475	13.84	0.2460	
500	14.57	0.2523	
525	15.30	0.2586	
550	16.03	0.2646	
575	16.76	0.2706	
600	17.49	0.2764	
625	18.22	0.2822	0.28125 — 9/32
650	18.95	0.2877	
675	19.67	0.2930	
700	20.40	0.2984	
750	21.87	0.3097	
800	23.32	0.3193	0.3125 — 5/16
850	24.77	0.3291	
900	26.23	0.3387	
950	27.69	0.3480	
1000	29.15	0.3570	
1050	30.61	0.3660	
1100	32.07	0.3744	0.375 — 3/8
1150	33.53	0.3826	
1200	34.98	0.3910	
1250	36.44	0.3993	
1300	37.90	0.4070	
1350	39.36	0.4150	
1400	40.83	0.4226	
1450	42.27	0.4300	
1500	43.74	0.4377	0.4375 — 7/16
1550	45.20	0.4446	
1600	46.66	0.4514	
1650	48.12	0.4588	
1700	49.57	0.4659	
1750	51.05	0.4725	
1800	52.46	0.4786	
1850	53.93	0.4858	
1900	55.40	0.4925	
1950	56.85	0.4984	0.500 — 1/2
2000	58.33	0.5048	

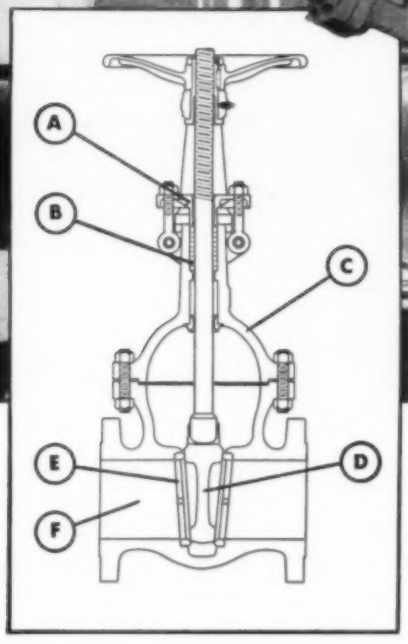
NOTE: This table is for oil of 15° A.P.I. gravity to 45° A.P.I. gravity. The capacity varies as the square root of the pressure drop. Capacities shown are for 80-lb. pressure drop. Orifice contour constant "c" = 0.75.

$$q = ck\sqrt{2gh}$$

q = cubic ft. per sec.,
h = head in ft.,
c = orifice constant, and
k = area of orifice, sq. ft.

Table by courtesy of Kobe, Inc.





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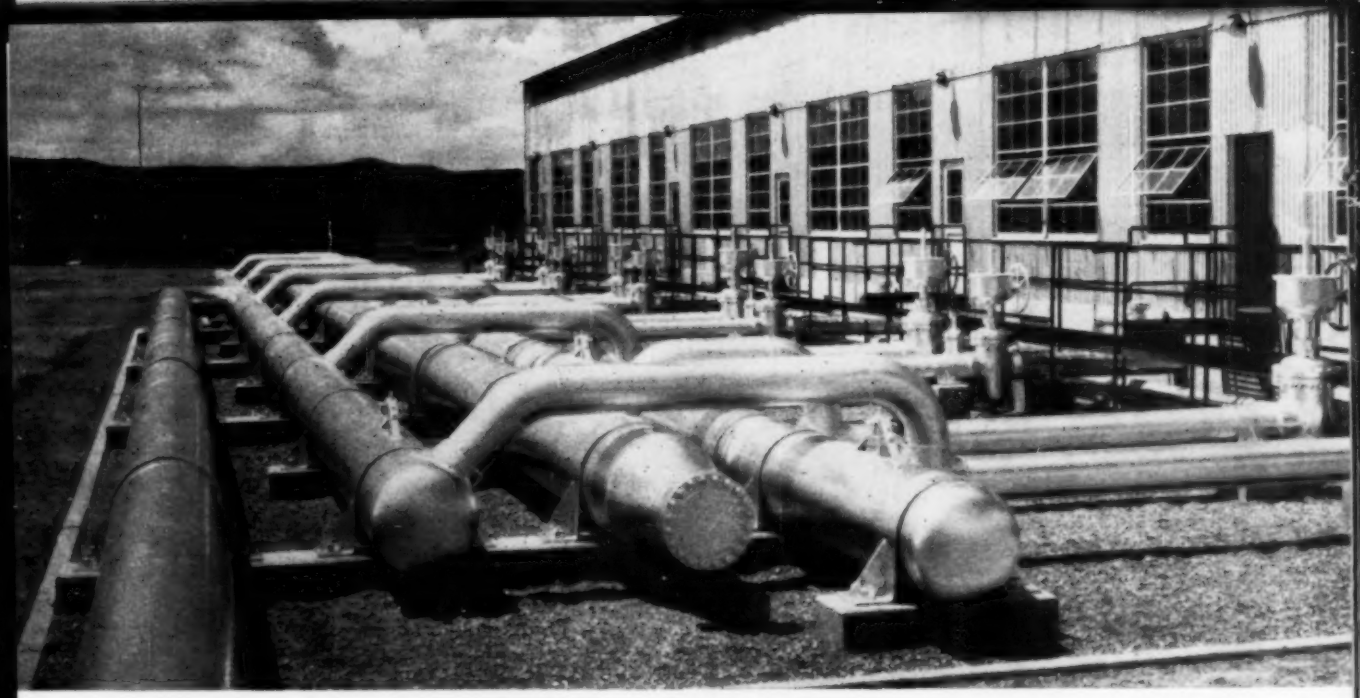

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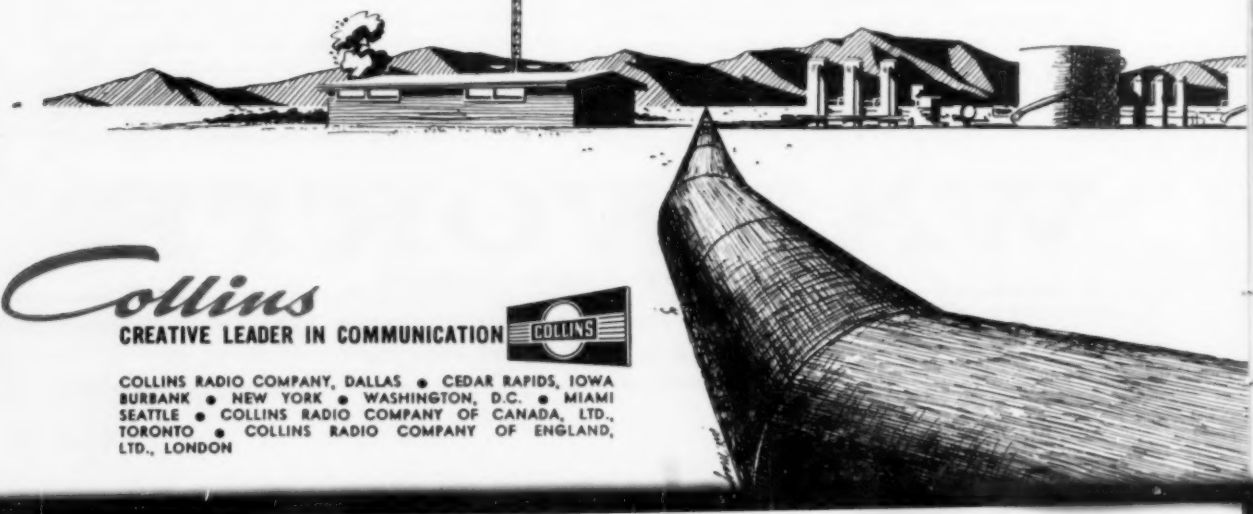

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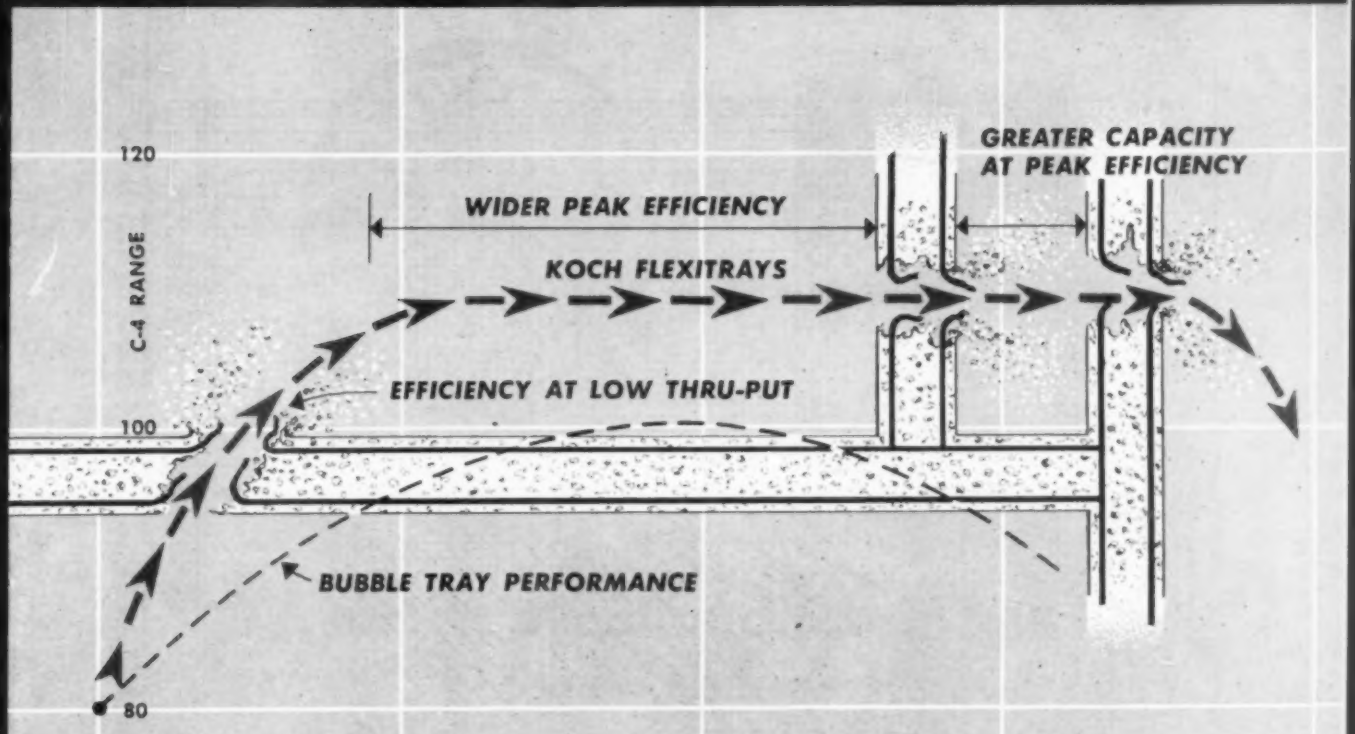

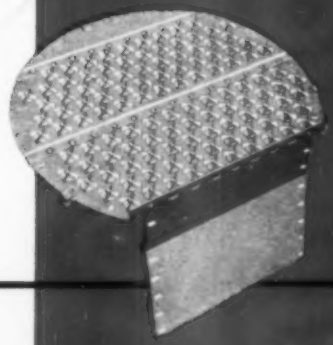

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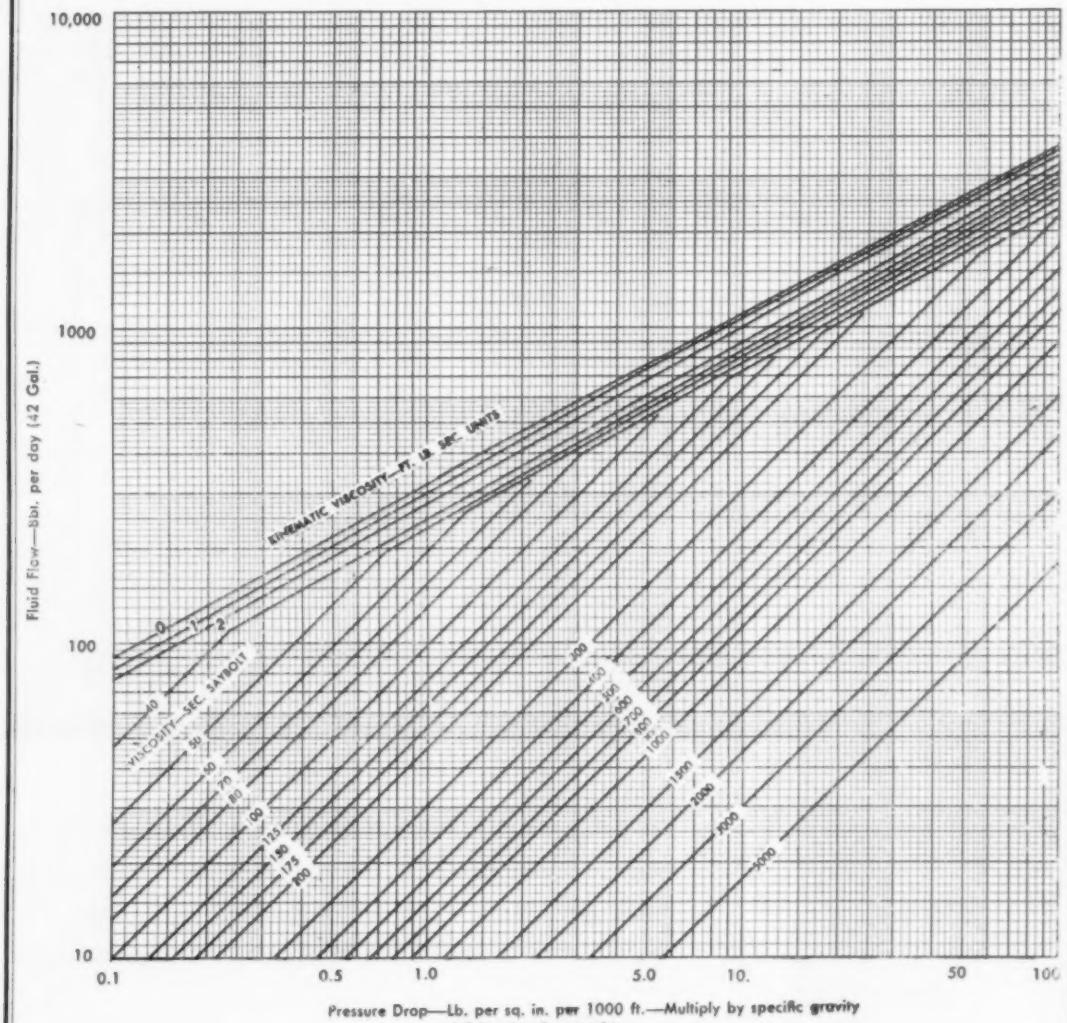
PRESSURE DROP IN 2-IN. EXTERNAL UPSET TUBING



Pressure Drop—Lb. per sq. in. per 1000 ft.—Multiply by specific gravity
A.P.I. external upset tubing

—Chart by courtesy Kobe, Incorporated.

Streamlining

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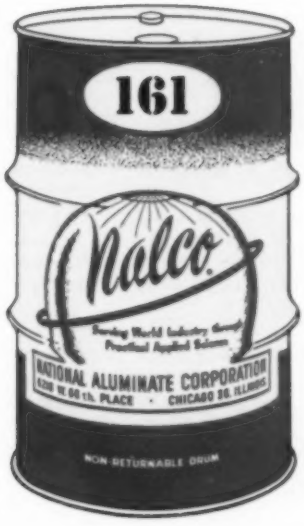

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You can learn to write technical articles which will delight the editor if you follow methods of professional writers described here

How to Write Better Technical Articles

John L. Kent

WRITING informative and interesting articles is easy — or, let us say relatively easy. It's simply a matter of knowing how.

As in any profession or business, the "know-how" makes the difference between success and failure — between an exhilarating adventure in personal expression or an agonizing chore.

Through long training and much experience the professional feature writer has learned the "know-how," including many short cuts which are his "tricks of the trade." Many of these are adaptable to technical article writing. But, first some basic considerations.

You will make your next article-writing task easier by first asking yourself why articles are written and published.

Articles are published in trade magazines to inform. Not to entertain. Not to show off the author's knowledge. Readers expect to find in engineering magazines the latest technical information which they might be able to use in their own work. The editors, in publishing technical articles on latest developments, provide readers with a continuous, up-to-date "textbook" in their fields.

This you probably knew. But do you know what an article is — and is not?

Articles Are Not Reports

Most engineers have studied only one form of writing at their engineering schools — the report. Because many articles in trade magazines and professional journals do resemble reports, they think that the article is a simplified report. This is not so. Technical articles are considerably different from reports as can be seen from a study of Table 1.

You will note that the different relative importance of timeliness, completeness and detail among the four forms of writing are compared. The method of presentation (story build-up) is different, as is the subject content and interest level at various points in the presentation.

The basic differences between the report and article can be summarized under three headings — (1) purpose, (2) method of presentation, and (3) readership.

(1) The purpose of a technical article is to inform people in the general area of your subject. The purpose of a report is to give specific data to people who are in the same specific line of work . . . perhaps working on the very thing you are working on. A technical article usually is read "when time permits" as background material. A technical report often has to be read to continue with the work.

(2) A technical article does not have to be as complete and as detailed as a report. You can omit details of minor importance. This "selective omission" is one of the major differences between the report and the article. A report does not have to be interesting. Most of them are not. But an article has to be interesting or the reader will go on to something else.

(3) A technical article will have a more general audience which will include many "non-specialists." This means that you will have to broaden your appeals somewhat. All of your readers will not be chemical engineers or chemists, for example. Some may be mechanical or electrical design engineers. For their benefit you may have to explain in simple terms some of the specialized techniques or devices with which they normally would not be familiar.

Technical articles fall into several well-defined categories. These are the major ones:

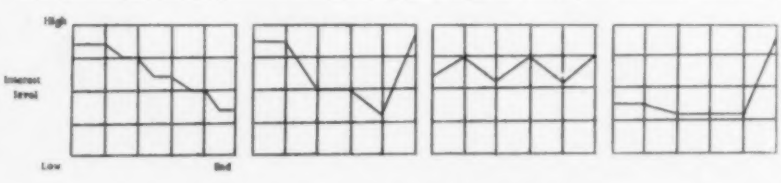
(1) Problem-and-solution article. This is generally a detailed write-up of problem encountered by the writer or his firm and how the writer (or his firm) went about solving it.

(2) The "how it works" article. This is generally a detailed write-up of a new device or system showing its possible application to other firms.

(3) The high-level discussion. This is a roundup on a problem discussing possible approaches, and ending with the problem unsolved. This is known as the "think" piece.

TABLE 1. Comparison of Basic Factors in Four Forms of Writing.

Factor	News Story	Popular Article	Technical Article	Technical Report
Primary object in writing	Get most information into first paragraph	Make reader read entire article	Give detailed information	Give complete details
Relative value	1. Timeliness 2. Brevity 3. Detail	1. Self-interest 2. Entertainment 3. Information	1. Information 2. Self-interest 3. Detail	1. Completeness 2. Worth to reader 3. Information
Story buildup	1st par. summarize	1st par. dramatic and timely opening	1st par. summary	1st sec. summary
	2nd par. state effect	2nd par. flashback (introduction)	2nd par. flashback	2nd sec. introduction
	3rd par. give cause	3rd par. development	3rd par. development	3rd sec. equipment and method
	4th par. give surrounding circumstances	Next-to-last par. "mystery solved"	Last par. summary	4th sec. discussion
	5th par. minor details	Last par. "wrap-up"		5th sec. conclusion and recommendation
Subject content	General information of interest to everyone	Unusual or new information of general interest	Specific information for a specific audience complete only to extent of understanding	Specific information which is a "blueprint" for action



Planning Is Required

Articles have to be planned. A written outline is a necessity for any article longer than 500 words. The outline depends on the subject, the treatment, and the type of article. A simple outline can be used for the problem-and-solution type of article:

(1) Preface (summary in one or two sentences),
(2) Introduction (details of the problem),
(3) Discussion (further elucidation of problems, with specific proposals, etc.),
(4) Conclusion (how solution was arrived at and how applied),
(5) Closing (summary ending, tieing article together).

To hold the reader you must present your technical material in the same manner that the professional writer presents his popular material in the feature-type article. The professional writer follows the story buildup presented in the comparison table. He gets attention by a dramatic and timely opening, which holds the reader while he goes through the necessary preliminary background to his story (flashback) then goes right on into the story. He summarizes or "wraps up" in the last paragraph.

In writing a technical article, you should follow a similar pattern. A well-written summary is usually sufficient to capture reader interest. The development and summary are similar, except that you do not have to strive for dramatic effect merely to be dramatic, nor appeal to the emotions which the feature writer utilizes where possible.

Professor W. S. Campbell, director of courses in professional writing at the University of Oklahoma, sums up the pattern for articles in these words:

Hey!
You
See
So

You will note that the "hey" is in the preface and introduction. Here the writer figuratively calls the reader to get his attention. His next point "you" is brought in immediately to show the reader that he (the reader) will gain something by reading further. In feature writing, the writer often combines the "hey" and "you" in one compelling sentence.

The "see" of the article is obvious — you are showing the reader so he can "see." The "so" is the conclusion. It is more than just "so" — meaning "therefore, etc." It carries with it the idea of "so what!" That's what the reader will be asking toward the end of reading your article. You have to answer the "so what" with a positive statement or two, showing the reader he has learned something or otherwise profited from reading your article.

The professional does not write his article in the same sequence as it appears. He generally writes the body, the "see" part, first. This is the "meat," the main thing you want to say. Next, he writes the "so" part. Here you tell the reader the consequence, significance, or the importance of the idea, process, or machine. Here you explain what your subject means to the reader. Don't be afraid to make positive statements.

The Author

John L. Kent is chief of the editorial bureau of Consolidated Electrodynamics Corporation, Pasadena, California. Since the end of World War II he has been a government information officer, free-lance science and industry writer, and Washington editor.

He is president of the Technical Writing Improvement Society, research director of the Western Technical Writing Institute, and member of the American Association for the Advancement of Science, and other professional societies.

After you have written these two segments, it will be much easier to write the first two sections. Generally, the best "hook" with which you intend to capture the reader will become apparent as you write the "so" part.

Keep Your Reader Interested

The writing in a good article must be readable. This readability depends in part on whether the reader is interested. By immediately stating in the opening of the article what the subject matter is, and what treatment of it the reader may expect, he will be more apt to be interested. If you can state in the opening few sentences that the information you are about to give the reader is for his specific interest—then you've "hooked" your reader and he'll stay with you.

This information is often taken out of the first paragraph by the editor and used as a "deck" immediately below the title of the article. Most of the by-lined articles in *The Petroleum Engineer* use the deck to summarize the content of an article.

If your article does not furnish enough "down-to-earth" examples, and deals too much in the abstract, you will find your reader trying to "interpret" your writing. This is dangerous. The interpretation will be subject to the reader's background knowledge, and this knowledge may be inadequate, or even erroneous. Thus he will get a different meaning from your story than you intended.

On the other hand, it is not necessary to "draw pictures" for everything you say. Some of the simpler and obvious examples should be drawn by the reader himself from the statements you make. If the reader does not get enough of this mental exercise, he may find your article dull, and may even suspect that you are deliberately writing down to him.

Professional writers use a number of devices or "gimmicks" for keeping their reader interested. Most of these can be adapted by the engineer in writing technical matter. Here are the major ones:

(1) Self-interest. Keep the reader in the story by telling him and showing him how he gains by following your advice or using the method or equipment you are describing. Do not be afraid to use the word "you" in your article.

(2) Keep reader excited. Tell your story swiftly, using action verbs. Make predictions and forecast results.

(3) Make it easy and understandable. Use analogy (comparison), contrast (extremes) and examples to explain your statements. Use photographs, drawings, tables, and graphs where possible.

(4) Make the article a "story." Get continuity and coherence into your presentation by using transition sentences as "glue" for your statements. ("But this gave us only part of the answer.") Break up big ideas into smaller units which can then be told in sequence.

Use the Psychological Approach

Borrowing from the bag of tricks of the professional writer is only common sense. And, almost all of the short cuts of the professional writer are usable by engineers in writing technical articles.

For example, many engineers have trouble right at the start. They don't know how to begin. Every professional writer knows that an outline and a period of planning are necessary. The outline helps to cull irrelevant material.

A "gestation" period is also a necessity. Professional writers point out that after making an outline, the writer should temporarily forget about the writing and go on to something else.

There are other hazards to good technical writing. These may be emotional or mental.

Try to forget your emotional and mental troubles. Many professional writers have acquired such a detached

attitude about their everyday problems that they are the despair of their wives, co-workers, and friends.

In editing many engineers run into another mental hazard — the problem of cutting. Most of us hate to discard what we had laboriously put together. But you must overcome this. Words are cheap, and the commercial publishing axiom "few words — higher rate" holds good in technical writing. The quality generally moves up as writing is condensed.

Another psychological factor to consider in technical writing is confidence in the face of criticism. The professional writer does not get discouraged when his writing is criticized. If he would get discouraged, he'd stop writing. The professional writer has learned that criticism must be expected. It is only natural for most human beings to be critical of actions and work of others.

Know Your Reader

You must also keep the psychology of the reader in mind. To write with greatest possibility of understanding, you, the engineer-writer, must know more about your reader. The things which please or annoy him in reading other technical information also please or annoy you.

No professional writer or editor writes for "everybody." Every publication has its definite audience. This is composed of people whose backgrounds, education, and even technical pursuits may be similar.

The engineer-reader, your counterpart on the receiving end of the transmitter-receiver system you operate when you write for him, has certain typical characteristics. If you know these, you can make your writing more effective.

First of all, your reader is a serious person who reads your article primarily to get information and not for enjoyment. Of course if he enjoys getting your information as he reads, then you have an unbeatable combination.

Being a serious person, he does not expect to be entertained merely for the sake of entertainment. He wants to get to the point quickly. So don't start off with a lengthy, albeit interesting historical account, or recount at length unusual happenings in your articles. Don't bring in material for "color" or "atmosphere," or — worse yet — to fill the space.

Because of his education and experience, your engineer-reader is orderly and neat. He thinks more logically than the rest of the people. Thus he wants to see some logical organization in the writing and in its printed presentation. You will please him by setting up your material in a chronological order.

Your reader is a detailist. In his own field he wants all the facts or some reference as to where he can find more. Don't be afraid to note in your story (even parenthetically) where more detail can be obtained. Your reader will appreciate this solicitude. Being a detailist, he wants to see all the pertinent bits about the subject, so make your illustrations tell part of the story or emphasize the part which is difficult to explain in words.

Your reader is a busy man. In most industrial fields the engineer is pacing progress. So you must use the least amount of his time to tell your story. This means that you cannot engage in cute openings, obscure analogies, or dramatic writing solely for dramatic effect. You've got to get to the point quickly. This business of time is becoming increasingly more important. Engineers must read more and more to keep up with their work, and at the same time they have less and less time.

Watch These Writing Faults

Editors find that there are several major faults which appear in most engineer-produced writing. These are:

1. *Poor planning.* Many engineer-written articles apparently were not outlined and therefore exhibit a lack of order which the reader expects. Make and follow an outline.

2. *Failue to consider the reader.* The first rule of writing anything is to ask yourself: "Who is going to read this?"

3. *Poor paragraphing.* Three common paragraphing errors are (1) lack of unity, (2) lack of a topic sentence, and (3) improper development of a paragraph.

Proper paragraphing is visible evidence of a good order. A good paragraph has a topic sentence which tells the reader what is going to be said in the paragraph. The topic sentence may also provide a transition (if needed) from the preceding paragraph. The remainder of the paragraph should be a development of the thought expressed in the topic sentence.

4. *Long and involved sentences.* Engineers and other technically-trained persons have a habit of qualifying each idea or statement with limiting phrases so that long and often involved sentences result. Shortening sentences will help readability and prevent grammatical errors.

If your average sentence length is 10 to 20 words, your writing is easy to read. But if the average runs over 30, watch out! Your readers are having trouble getting your "message."

5. *Negativism.* Engineers too often use the negative to describe the properties of anything . . . such as "Do not fail to remove handle . . etc." when instruction should be "Remove handle, etc."

6. *Wordiness.* Many technical articles are excessively long because authors failed to edit. An article should be edited so that the final writing is the bare substance with just enough details to carry the story intelligently. This means condensing the pruning, both in the subject included (selective omission), and in the manner of presentation (deliberate conciseness).

7. *Jargon and cliches.* Engineers insist on using certain words and phrases which to them have become sacred.

8. *Lack of "sell."* Engineers generally don't know how to "put over" an article. Most of the technical articles are uninspired and uninspiring. To get good presentation, you must not only get facts down briefly, but so arrange them that the reader can sense that back of the arrangement and presentation was an engineer who knew what he was talking about. Directness, simplicity, and enthusiasm help "put over" an article.

Placing the Article

This "lack of sell" may also prevent you from placing an article with an editor. Before an article is published it must first be accepted by the editor. And, getting acceptance is not difficult if you (1) know your subject, and (2) know how to present the information.

Approaching the editor with an idea for an article is not difficult. He is a human being just like you and will respond as you will. Ordinary professional ethics and the usual business courtesy is all that is required here.

Even if the editor is located in your city it is still best to write. The letter should do justice to your cause. You must give as much information as possible in a one-page letter. Editors are prejudiced against lengthy letters.

You should be able to summarize your article and give your qualifications for authorship in two paragraphs. In a third, you should be able to tell the editor of the possible interest among most of the publication's readers, the length of the article, the kind of illustrations available, and how soon you can complete the article.

In reply the editor will either (1) reject it completely (usually giving good reasons), (2) tell you to go ahead as you planned, or (3) tell you how your proposal may be acceptable. In the last case he will offer suggestions on specific points of coverage, slanting, and so forth.

Having obtained an O.K. to go ahead, all that you now have to do is write the story and deliver it on time.

* * *

How Does Your Management Rate?

THE highest competition on the American economic scene today is for management personnel. A company that has good management and is developing management material as it goes along is running ahead in the race for success.

Everybody wants to know what kind of management a company has. The investor wants to know, the employees and potential employees want to know, the banker wants to know, the customers want to know.

It is a vital question but one that is hard to answer.

You can't pin your analysis on past performance. Changes can come too quickly for that. A present good management who hasn't prepared for any contingency is gambling with the company's future but the situation will not be obvious.

One of the few institutions that have attempted to appraise management is the American Institute of Management, a non-profit foundation in New York. AIM works with theoretical aspects of overall management function on the policy level rather than operational; i.e., the forest rather than the trees, emphasizing the relations of each part to the whole. AIM management studies must contain a philosophy of management, easily understood, and they must have the social or academic significance of bringing about changes. These changes may be in the management team discussed or in all industry, and they may be in the theory of management in general.

The primary purpose of the Institute is educational and many of its publications are required reading in various colleges. It collects and distributes to its 17,000 members the best theories available on management in the free enterprise system. Management is still a developing science and unless it meets the demands of the organization it leads, the organization naturally follows a decline. It is in this spirit of improving management that the Institute examines 5000 corporate managements each year in what is termed "A management audit."

The audit is based upon 10 basic categories which are functional rather than organizational. Table 1 gives the division, shows what importance is given to each function by the Institute and gives the minimum and maximum ratings by which the AIM staff evaluates management. The ratings are determined by a series of more than 70 questions similar to those on this page.

These 10 functions are described by American Institute of Management in this way:

ECONOMIC FUNCTION

Corporations, like individuals, develop distinctive characteristics over the years. These characteristics derive from the purposes which the corporation attempts to accomplish, and by its habitual way of carrying on its business.

Over the span of time, each company develops its own tradition. These traditions are truly important. They express the moral quality of the whole organization. A quality which in turn depends upon the relative importance of the company's purposes.

CORPORATE STRUCTURE

In any continuing organization, an established way of doing things must ultimately result in a formal organizational structure. In terms of the corporation, this amounts to saying that distinct lines of communication develop within the enterprise. The way these lines of communication intersect determines how decisions are arrived at, how they are put into effect, and how and by whom their results are appraised.

In certain corporations, the making of fundamental decisions is often untimely. On occasion, fundamental decisions are never arrived at. Instead, problems are allowed to "sort themselves out." In other corporations, basic policy decisions are made but are not followed through or are carried out half-

Can You Answer These Questions About Your Management?

What contribution does your company's operations make to the national economy?

Is your company decentralized or is control exercised from a central point?

What is the history of earnings and assets since World War II?

Is there an established dividend policy?

What research activities are conducted and how long have they been established?

Is your board an inside or outside board?

What form of budgetary control is exercised?

What has been the growth in productivity per employee?

What structural link exists between advertising, selling and production?

What procedures are followed in training promising executives?

Table 1. Audit Rating Table

	Optimum Rating	Minimum Rating for Excellence
Economic Function	400	300
Corporate Structure	500	375
Health of Earnings Growth	600	450
Service to Stockowners	700	525
Research and Development	700	525
Directorate Analysis	900	675
Fiscal Policies	1100	825
Production Efficiency	1300	975
Sales Vigor	1400	1050
Executive Evaluation	2400	1800
	10,000	7,500

heartedly. In some companies, no attempt is ever made to evaluate the results of policy decisions and the way that they have been carried out.

It is astonishing that perhaps in the majority of corporations, job evaluation and merit rating have not been extended systematically up to the top executive levels.

HEALTH OF EARNINGS

Size of earnings is not in itself a criterion of health of earnings growth. The earnings record during years of general prosperity or of unusual temporary demand for a company's main products is no criterion whatever. Most emphatically, earnings of a natural or artificial monopoly cannot be regarded as basically healthy, no matter what their size. Therefore, it is not the size of earnings alone that determines the health of earnings growth, but the conditions under which that growth has come about, its continuousness, and its ability to be sustained, at least moderately, even during depression years.

The best corporate managements pursue policies intended to prepare the company for unforeseen contingencies. As a result, the most efficiently managed corporations show satisfactory profits even during times of bad trade.

How these profits are earned, whether they result largely from the sale of new products continuously generated by development and research work, or whether they merely bear a statistical relationship to the growth of population and national income, cannot be left out of account.

SERVICE TO STOCKOWNERS

What benefits have the proprietors of the company received from their investment in it, directly in the form of dividends, and indirectly in the form of growth in their equity value?

The individual investor gains no benefit from a corporation whose own advance has been at the expense of exposing the stockholder to undue risks or of failing to pay him an adequate return for the risks he has voluntarily assumed. In the course of its researches, the Institute has uncovered numerous instances of companies well-run in other respects, but whose officers have disregarded both the private interest of the shareholders and the general interest of the public. Such companies are not well conducted; their operations are out of harmony with the needs and trends of our time.

Fairness to stockholders is perhaps the most difficult category of evaluation to define. There can be few, if any, hard and fast rules to measure quality under this heading.

RESEARCH AND DEVELOPMENT

It is by now an axiom of management quality that increasing attention must be paid to research and development work as the years go by. Top management which fails to give adequate attention to ground-breaking experiments is simply failing its managerial purpose.

Unfortunately, the term "experiment" is misunderstood in the average corporation. Perhaps because the chemical and petroleum industries have done an outstanding job of research most businessmen seem to feel that unless this specific type of work is undertaken, no research worthy of the name is being done. With this attitude is coupled the apparent belief that research can stop at this point and yet prove wholly adequate. The fact is, however, that the areas in which profitable research can be undertaken are co-extensive with every activity of the corporation, no matter what the nature of its products or the scope of its operation.

The neglected areas of research, even in companies aggressive in the development of new products, are usually the following: Market research is neglected or underemphasized; few companies have properly developed research as to the most fruitful forms of advertising; inquiries into economical handling, packaging, shipping, and many other individual phases of manufacturing and distribution are given insufficient attention.

DIRECTORATE ANALYSIS

The Institute, after studying thousands of corporations, is convinced the greatest single weakness in American business organization lies in the composition of the average board of directors. Less effort is devoted towards improving this phase of the organization than to any other.

Until two years ago, this was beyond question. Since then increasingly critical expressions by stockholders have led to some improvement. In fact, more than one-half of the correspondence of the American Institute of Management, in answer to inquiries from the outside, is now concerned with matters regarding directors.

FISCAL POLICIES

Most of the financial difficulties experienced by corporations during the past 30 years have originated less in the development of an adverse economic environment than in defective fiscal policies of companies. During periods of general refinancing, one company may be selling preferred stock in order to retire bonds, while its competitor may be selling bonds to retire preferred stock. The former is sacrificing an immediate tax advantage in the search for long-term safety; the latter, sacrificing long-term safety in return for the temporary tax advantage.

Management with a sound concept of fiscal conduct should be aware that, perhaps within a decade, significant fluctuations in earnings and in the replacement cost of plant assets may occur. Proper fiscal procedures would deter management from dissipating liquid assets which may be needed to make up for the deficiency between annual depreciation charges and the replacement cost of annual wear and tear.

Sound fiscal policy must at all times be consistent, must be coordinated with the overall needs of the enterprise, and must have the main purpose in view of preserving the corporation from perhaps unforeseeable stresses whose effects could be disastrous if the company is unprepared.

PRODUCTION EFFICIENCY

Production efficiency is one of the major contributions made to world progress by American business. The larger markets of America, and the resulting possibility of long-line production, are in part the cause of our increasing superiority

Table 2. Excellent Oil and Natural Gas Industry Managements for 1956.

Amerada Petroleum Corporation
Atlantic Refining Company
Cities Service Company
Continental Oil Company
Creole Petroleum Corporation
El Paso Natural Gas Company
Equitable Gas Company
Gulf Oil Corporation
Humble Oil & Refining Company
Lone Star Gas Company
Louisiana Land and Exploration Company
Ohio Oil Company
Oklahoma Natural Gas Company
Pacific Gas & Electric Company
Panhandle Eastern Pipe Line Company
Phillips Petroleum Company
Seaboard Oil Company
Shamrock Oil and Gas Corporation
Shell Oil Company
Socony Mobil Oil Company
Standard Oil Company (Indiana)
Standard Oil Company (New Jersey)
Standard Oil Company (Ohio)
Standard Oil Company of California
Sun Oil Company
Texas Gulf Sulphur Company
The Texas Company
Washington Gas Light Company

over European production. In turn, the vast potentialities of the American market have spurred us to surprising competitive efforts. Our competitive standing is paramount throughout the world in all mass production standards.

Nevertheless, there is discernible need on the part of management to reappraise its plant locations, the relative advantages of horizontal or vertical integration, the efficiency which might be achieved by discarding multiple product operations within one plant or vice versa; and the advantages to be gained by permitting greater autonomy at separate production centers.

Labor-management relations are the primary management concern today. This is certainly true of the larger corporation. Friction is less apt to develop in smaller companies between workmen and top management.

In general, a corporation becomes successful because of the competitive superiority resulting from its lower cost methods of production. No matter what the product, this is a basic axiom of corporate progress. Therefore, production efficiency must not be gaged alone by output volume.

SALES VIGOR

More expressions of concern are presently being made by managements over the inadequacy of their sales division than over any other single aspect of business administration. In the past, the contrary has been the case. The greatest achievement of American business has been sales promotion, exceeding even our production efficiency. The aggressive search for markets is an American characteristic, compared with the European attitude of waiting for the purchaser to materialize. In most European companies, sales executives are not regarded as top level officers. In a number of languages, indeed, there is no phrase meaning sales manager.

The Institute gives greater weight to the sales effort than to any other single departmental activity of the corporation. **The ultimate purpose of every corporation working for profit is to transform a stated sum of cash into a larger sum of cash.** The incidental costs of labor, materials, and overhead are necessary expenses in this expanding transformation. They would be of no value whatever were the final product not translated into money through sales.

In the modern world, sales are more closely related to advertising in all its forms than to direct salesman-customer contact. Because of this, the Institute pays increasing attention to the effectiveness of advertising policies pursued, since such policies both get the goods into the hands of dealers and out of their hands into those of the ultimate user.

EXECUTIVE EVALUATION

Excellent management demands that men work together in harmony, each pursuing his own special task within the general effort, conscious that he is participating in a joint endeavor with men who command his respect.

This unity of command is the central question to be sought in any management audit. It exists only where a qualified top executive is able to surround himself with other qualified men who will operate with him as co-executives and not as henchmen.

It is essential to learn whether the executive group actually operates as a team, and whether each man is already grooming one or more possible successors to take over this task when the day comes for his retirement.

In no case should such possible successor be chosen from among an executive's relatives! Nepotism, indeed, is the antithesis of sound management.

Executive evaluation is by far the most important of the 10 functional divisions of the management audit. The other nine categories, in fact, are no more than expressions of the thinking and actions of the executive group. They are examined separately in order that the effective results of the human qualities of the men in management may be measured. Analysis of the individual officers is therefore indispensible to management appraisal.

The attitude of the public towards the individual company is a prime expression of the state of public knowledge regarding the caliber of the men in top management. This means: The good will of the communities in which plants, offices, and sales organizations are located; the expressed confidence of stockholders in the ability and integrity of the officers; the quality of the mutual relations existing between the company and its suppliers and customers; the extent to which relations with the public authorities are honest, forthright and healthful. Good will is earned not by advertising, but by the daily actions of men of the proper type conducting the affairs of a responsible corporation.

Table 2 lists the managements in the petroleum industry and natural gas industry which have been graded as excellent by the Institute. Excellent means a point rating of more than 7500. Of the 409 companies which the Institute rated as excellent during 1955 only 17 had point ratings that exceeded 9000 of the possible 10,000.

The American Institute of Management is a non-profit foundation. The directors lean heavily toward university professors and the objection might be made that the management audit is highly theoretical. It must also be pointed out that the Institute's analyses are published expressly for its members.

The outline of functions and their evaluation given in Table 1, however, is an interesting and probably a generally reliable guide to the desirable but difficult job of appraising a management. ★ ★ ★

Twelfth of a series

Communication:

Are We Using Our Powers of Observation?

Dennis Murphy

ONE of my fellow workers handed me a card the other day to "test my brains," as he put it. He asked me to read only one side of the card. It said:

> **FINISHED FIXTURES ARE RESULT OF YEARS OF SCIENTIFIC STUDY AND MANY YEARS OF EXPERIENCE**
>
> **Count the F's in this sentence. Count them only once. Don't go back to count again. How many F's do you find? See other side.**

The other side of the card read:

> **One of average intelligence finds three F's in the sentence. If you spotted four, you're above average. If you found five, you can turn up your nose at almost anybody. But if you caught six, you're a genius and too darned good to be wasting your time on foolishness like this.**

I found only five. "This is no test of brains," I said, looking down my nose at him; "it's a test of *observation*." But we should observe with our brain as well as with our eyes.

What Is Observation?

To have great powers of observation from birth is to be born to the purple, to move among the elect. We need to develop our five *senses* (feelings) as well as our *sense* (brain). One aim of education is to teach us to see, hear, smell, taste, and touch — in short, train us to observe. Too few people ever learn to observe or listen well, much less to smell or taste expertly — if we use *observe* in its broadest connotation. Most of us observe only well enough to "get by."

Observe means *see*. But Roget's *Thesaurus* also gives these synonyms:

look	watch	survey
view	gape	inspect
eye	ogle	perceive
peek	stare	discern
glance	leer	scrutinize
peep	glare	examine
glimpse	gaze	witness
notice	glower	detect
scan	gloat	regard
note	pore	contemplate

Dr. Murphy is administrative assistant, Service Pipe Line Company.

Some Laws of Nature

The *hunting animal* (like man, dog, cat, or monkey) has binocular vision. Its eyes, set in the front of its head, can be readily brought into focus on a single object, thus giving accuracy of vision.

In contrast, the *hunted animal* (like the deer, rabbit, mouse, or bird) has eyes on the sides of its head. This gives it a wider range of vision for detecting enemies, but less precision. Usually, it sees an object with only one eye and therefore lacks third-dimensional depth. Wild animals keep their observation at a razor-sharp edge. Life under domestication, however, dulls that edge. So, man has lost much of his keenness of sight, smell, and hearing — if not his "touch"!

Science Helps Man to Observe

Magnifying glasses, microscopes, telescopes, X-ray, and other optical instruments have helped man's powers of observation. Today over 25 per cent of our school-age children need glasses or eye treatment, and about 35 per cent of the 167 million people in our country wear glasses, according to statistics from the American Optical Company. Numerous others who need glasses get along without them.

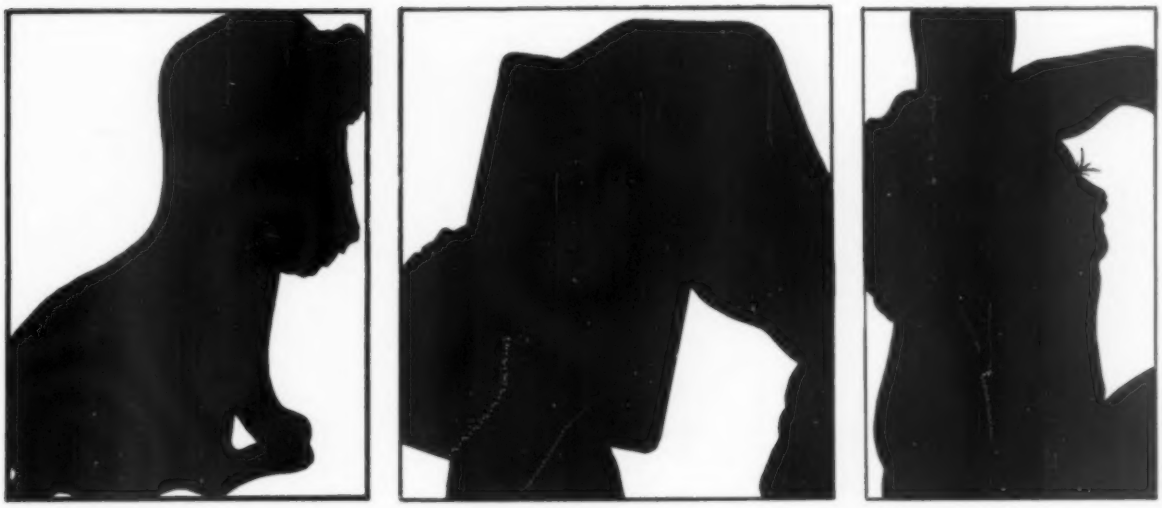
Many of us suffer from near-sightedness (myopia), far-sightedness (hyperopia), astigmatism, cataract, or glaucoma. Not to mention short-sightedness! An *ophthalmologist* (big word for *oculist*) is a medical doctor and often a trained surgeon who treats defects and diseases of the eye. He shouldn't be confused with an *optometrist*, who merely tests and examines the eyes to prescribe or sell eye-glasses. And an *optician* is a merchant or manufacturer, who makes and sells binoculars, lenses, and spectacles. Your grandpa called them "specks."

According to the Human Engineering Laboratories, about one per cent of all women and seven per cent of all men in our country are color-blind. Often they are blind to certain colors only; usually they can't tell the difference between reds, yellows, and greens. Yet many of them drive cars in city traffic by "location" of the lights! Incidentally, but not *too* incidentally, which color of the stoplight is at the top? the middle? the bottom? Are you sure?

Can Observation Be Cultivated?

"Most people have remarkably poor powers of observation," says Dr. Bruno Furst in his *Practical Way to a Better Memory*. But observing is communication skill, and you have to train yourself to observe more accurately and completely. How?

1. Develop your five senses to increase your *perception*.
2. Cultivate your *memory* of unusual characteristics.
3. Take extraordinary care in *recording* what occurs.
4. Be accurate in *recalling* details.



5. Use practical *exercises* in sight training (Rorschach Test and others).

Most of us fall into two types: the predominantly visual, or eye-minded; and the predominantly acoustical, or ear-minded. And some are motor-minded, but nobody is completely of any one type. Artists and authors are especially eye-minded; musicians, especially ear-minded.

(I happen to be so eye-minded that I carry a strange picture in my head of the position of all numbers from 1 to 100, where the design reiterates. I also hold an image of the shape of the year, with each month in a different place — and all of them in color! Even in memorizing music, I see every note in place on the printed page.)

Of our five senses, sight and hearing are the most important. Helen Keller, famous blind and deaf lecturer now 76 years old, urges us all to use our gift of sight fully — to use our eyes as if tomorrow we were to be stricken blind. She is living proof that observation can be cultivated even under the colossal handicaps of sight and hearing cut off.

Let me quote from Van Wyck Brooks' recent book entitled *Helen Keller:*

"For the world in which she lives herself is built by touch-sensations, devoid of physical color and devoid of sound, and she has written much about the hand by which she lives and which takes the place of the hearing and sight of others. Exploring the faces of her friends and people whom she has just met, she reads them as if she were clairvoyant, and she can distinguish the Yankee twang and the Southern drawl she has never heard by touching two or three spots on the throats of the speakers.

She says that hands are quite as easy to recognize as faces and reveal the secrets of the character more openly, in fact, and she can tell from hands at once whether people have large natures or whether they have only "dormouse valor." In the soft smooth roundness of certain hands, especially of the rich who have never known toil, she feels a certain chaos of the undeveloped; and, in her land of darkness and silence, she can feel with her own hands the beautiful, the strong, the weak, the comic. . . .

She can always distinguish Fifth Avenue from humbler New York streets by the odors issuing from the doors as she walks past. She knows the cosmetics that women are using and the kind of coffee they are roasting within and whether they use candles and burn soft coal or wood, just as she recognized St. Louis from the smell of the breweries miles away and Peoria from the smell of the whiskey stills. "Listening" with her feet, she says, in a hotel dining room, she knows the moods and characters of people who walk past her, whether they are firm or indecisive, active or lazy, careless, timid, weary, angry, or sad; and she will exclaim, "What lovely white lilacs!", knowing they are white by touch or smell, for in texture and perfume white lilacs differ from purple. . . ."

What Others Observe in Us

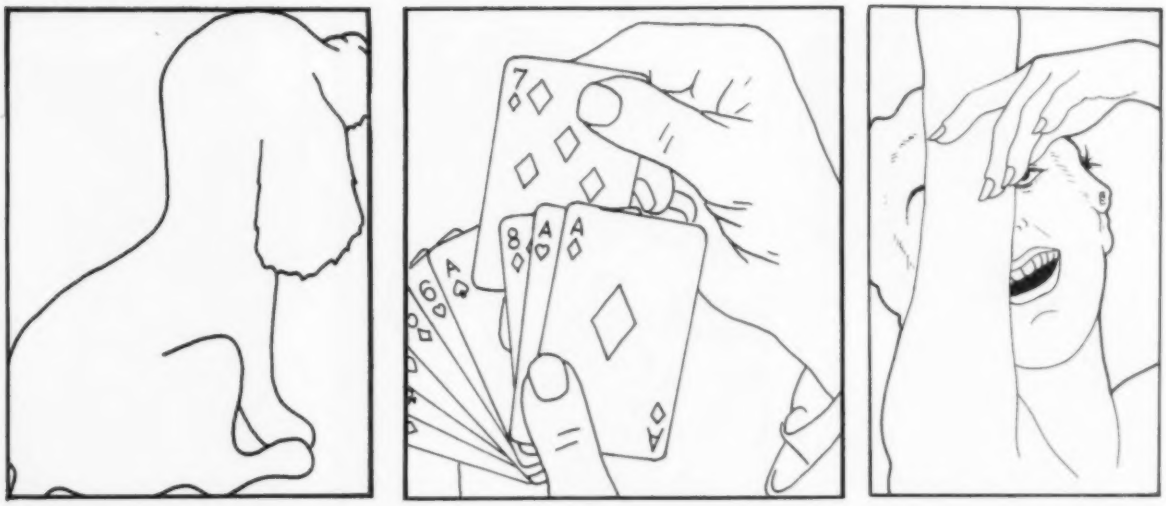
Everything we do and say, or don't do and say, communicates something about us. Our very presence or absence has a meaning; whether our work is finished or unfinished carries significance; and our desire to associate and participate reveals a great deal about us. Some men throw their weight around through their position, salary, status, and possessions. Others don't.

Even inanimate objects become significant symbols in business — like a silver water holder or carafe, a personal memo pad, a signature stamp, modern blond-mahogany office furniture, or heavy carpeting instead of linoleum or wooden floors — and communicate something about men and their company to all who observe.

Trifles show character and "make the sum of life," wrote Dickens. And we observe men and women continually, especially through these "windows":

1. *Actions* — habits; conduct; mannerisms; reaction to stress; their "breaking point"; their drive and interest
2. *Appearance* — facial expression; eyes; mouth; hands; complexion; Adam's apple; posture and gait; clothes
3. *Surroundings* — possession of worldly goods like house, car, airplane, golf clubs, books, antiques; quality of furnishings; order or disorder
4. *Attitudes* — opinions of men and events; attitudes toward wealth, women, children, and God; optimism or pessimism; interest in life for its own sake or for what they can get out of it.

Past actions, or performance, are more important than present appearances. Disraeli declared "there is no index of character so sure as the voice," and Emerson said that "what you are speaks so loud I cannot hear what you say." Surroundings, to me, are far less important that attitudes. And one of the ironies of life is that interesting persons we'd like to know better have a way of escaping us, whereas those we don't care to know better are ubiquitous! Too many ambitious young businessmen cultivate only those in higher rank-and-salary



brackets, thereby missing many rich associations. They observe only for selfish reasons.

Can We Believe Our Eyes?

Observation leaves a large area for difference, variance, and error. "I'm from Missouri — show me!" and "Seeing is believing" can't be trusted. No two people ever see any given person, object, event, or thing in precisely the same light. Human beings, more like chameleons than machines, are so given to change that nothing is permanent except impermanence.

Two amazing truths about this world are: No two human beings are exactly alike of the three billion or so in it; and no human being is merely one static personality to all others, but many different personalities to many different people. One man's villain is another man's hero!

In 1954 a television play presented the story of a struggling young artist whose ambition was to paint the perfect picture of a madonna. The point of the play was that observers saw in this artist what they *wanted* to see; his mother saw one person; the taxi driver saw another; the building superintendent, another; and the eavesdropping scrubwoman, still another. When the artist's model reeled drunkenly into his studio one morning, he pushed her aside in disgust and disappointment. She fell, fracturing her skull. Was it her accident or his murder?

In Eugene O'Neill's *Strange Interlude* the leading character, Nina Leeds, can be observed as a daughter, a wife, a mother, and a mistress. Many plays and novels reveal how we vary in our observations. Yes, Freud is right: we see what we *want* to see, hear what we *want* to hear, and remember what we *want* to remember.

In those we love, we observe lovable traits; in those we hate, we observe hateful traits. It all depends on *us!* In looking at anything, *your* eyes focus on a certain set of details, whereas *my* eyes focus on a different group of details. Can we train our eyes to catch the most important details? Yet what *are* the most important details, anyway?

Because we see things not as *they* are, but as *we* are, and because people are complex creatures, we should be on guard constantly against forming judgments from insufficient and erroneous observation. Trivial actions are often dead giveaways of character, but we have to keep our eyes peeled for signs that fail. One detail never tells the whole story.

What Do Actions Communicate?

Shakespeare says, "All the world's a stage, and all the men and women merely players." A drama is a story told in action, but few employees consciously play a role while working. Models and receptionists, perhaps. Yet doing is the major role of most employees in industry and business, and demonstration or "showing how" is the most effective communication for much job training.

Actions are (1) *habitual, automatic,* or *customary,* and (2) *occasional, temporary,* or *done in crisis.* So, we observe to get information about quantity and quality of performance, employee attitudes, character traits, work habits, and physical surroundings. These are highly important to all supervisors, who are responsible for others' safety, health, and physical comfort as well as for productivity, output, and harmonious relationships.

We observe to detect anything unusual or "out of line," much as an internal auditor examines a statistical report. We observe to gather facts at first hand, but we run into many errors in the realm of observation. We should remember that we seldom get all of *the* facts from observation; instead, each of us gets *our* set of facts. In observing, we're prone to interpret the way we want to.

What to Look For

A man's *walk* is an automatic action that communicates personality. Usually a frank, open-hearted fellow strides along easily; a lazy person shuffles or drags his feet; a slow-witted guy steps heavily; a reckless or nervous chap has a springy, headlong, or precipitate gait. There's a lot of difference between Emmett Kelley's shamble and Marilyn Monroe's swing!

The *eyes* and *mouth* are chief centers of facial communication. Artistic people stare dreamily into space; those with shifty eyes may be nervous or timid rather than guilty or untrustworthy; and men who look upward, not downward, all the time are prone to be optimistic and idealistic. Too many businessmen look at the ground instead of the sky! And most of us prefer open, candid eyes that look straight into ours, without staring like a brazen criminal.

A *mouth* that is broad often indicates serenity and generosity, whereas a small mouth with thin lips denotes primness. There's an old wives' tale that space between the teeth indicates a sensuous, often a sensual, nature. Watch the mouth in a crisis: it's a barometer to a man's determination far more reliable than a strong or receding chin.

Hands are a pretty reliable index to character. A man with his hands in his pockets all the time will never "set the woods on fire." He'd have to take at least *one* hand out of his pocket! People who use their hands freely in talking (a trait of teachers, engineers, and others) are likely to be warm-hearted creatures of feeling. And whose hands could be more expres-

sive than Ed Norton's (Art Carney's) in *The Honeymooners?*

A man who stands, legs apart, with both arms akimbo or across his chest may be showing either resistance to you or assurance in himself. Demagogues, sooner or later, raise their arms above their shoulders with arms outstretched. How can we cultivate quiet, peaceful hands? By forgetting them — being totally unaware of them.

Men are seldom conscious of their mannerisms; women usually are, even to the point of cultivating them and cashing in on them. The angry crushing out of a cigarette stub; the nonchalant flick of a cigarette holder; the cracking of one's finger knuckles (like Alexei, the husband in *Anna Karenina*); picking one's nose abstractedly; eternally prinking one's hair; or using curlicues and telltale letter-formations in one's handwriting — all these mannerisms can *help us understand people.* But here are some important warnings:

1. *Don't pigeonhole a man by his dominant trait.*
2. *Remember that one trait never reveals the total man.*
3. *Get as complete a picture as you can from many traits.*

Mental sickness is increasing in our country. In 1952 nine million people were confined to our mental institutions, or one out of 18. A similar number were ill but not confined to sanitariums. All supervisors need to *observe closely* to detect fear, worry, fatigue, or nervousness. We can usually recognize the worried worker by:

(1) Sudden change of behavior
(2) Irritable disposition
(3) Sudden sadness or absent-mindedness
(4) Too many mistakes or accidents
(5) Increased absenteeism or fatigue
(6) Excessive use of alcohol.

When we observe these signs or symptoms, we should arrange a heart-to-heart talk with the man to determine what is wrong. After we learn *why* (the cause), we should try to help the employee effect a cure.

We may relieve the employee of physical overstrain and mental anxiety, consult with the personnel manager, and enlist medical aid if it's needed. Sometimes a shift in duties will help; sometimes community aid is available. In short, the foreman should become the confidential adviser of the employee in a friendly, sensible way.

Importance of Observation

All businessmen — supervisors, salesmen, and lawyers especially — need to cultivate their ability to observe. And they can. Traffic cops learn to nab numbers on license plates of cars, and newspaper reporters learn to watch the five W's of a story. FBI agents undergo a series of tests on observation to train themselves in rapid and accurate detection. One favorite stunt in law schools is the "planned event" that students witness and then testify about in trial — with the usual large number of errors sworn to "under oath."

Among all skills of communication — thinking, observing, writing, reading, talking, and listening — *observing* is highly important. It operates (or should) while we think, write, read, talk, and listen. In that respect it is almost as important as thinking, which operates simultaneously with all others, too. Observing also includes communication by smell, taste, touch, and movement (motion or acting).

Observation is indispensable to all businessmen because

1. *It is a universal medium of experience.*
2. *It is a proved source of information.*
3. *It is a sound basis of judgment.*
4. *It is a rational cause of action.*
5. *It is a reliable essential in handling people.*

Observation is the chief tool in selecting, upgrading, and counseling all employees. Employment supervisors, who interview applicants and hire new men, need skill in observing to estimate the potential of newcomers. Fitting the right man into the right job saves the company's time and money. Failure to develop a good man after he's hired often results from inaccurate or biased observation. Workers get pigeonholed much too easily! Any management development program, too, leans heavily upon the knack of spotting executive capacity. In fact, no decisions are made and no problems are solved in business without this valuable instrument — observation. Several "look-see" meetings are worth all the hearsay in the world!

How Do You Size Up People?

1. *Put behavior ahead of appearance.* Too many businessmen select steno-secretaries for the size of their breasts and the shape of their legs. "What's wrong with that?" you are asking. Nothing — but it's a sign of emotional immaturity. If a man's work is an endless grind of dreary routine, of course, there's no sense in surrounding himself with a drearier raft of old bags. Yet if he'd looked for efficient performance and cheerful attitude in the first place, maybe his office work wouldn't be a blob of endless monotony now. (Gong! End of round 1.)

2. *Doubt your pet theories.* That old trick of purposely dropping some object to see whether an applicant will break his neck to pick it up is no test of politeness. Nor is asking for a fountain pen and observing the quick or clumsy response any proof of efficiency.

Most pet theories are unreliable. A beautiful office steno may not be a dumb Girl Friday, and a fellow who shows up poorly on all the tests may be excellent for this job because he has *the will to work.* Again, a practical "self-made" engineer may shy away from hiring an engineer with several degrees who could supplement his work perfectly.

By and large, we're all prone to prefer people like ourselves and disparage those who are much different from us. But it's well to remember our own prejudices and make plenty of allowances for them.

3. *Avoid hasty conclusions.* Frequently our first impression is more lasting than correct. Snapshots are snap judgments. We need to observe, again and again, under different conditions and various circumstances to get a full-length portrait. When we *understand motives,* we often change our mind about actions.

You don't like this new employee? Why not? He reminds you of a guy you once hated in college; he threatens your present security in your job; or — you won't believe this! — he has some traits that are just like your own.

And because you don't like this employee, you warp your estimate by looking for his weak points. If you liked him, you'd be making alibis for them and raking and scraping to find his good points.

4. *Look for the good in others.* If we develop the habit of overlooking foibles or weaknesses in others, we soon discover endurable qualities. They're there. The skinflint boss who died last week left $20,000 to the Heart Fund and his eyes to an eye-bank! The sourpuss accountant in Room 687 has just adopted a month-old baby boy!

An executive once held up before the blackboard a sheet of white paper with a black X in the center. "What do you see?" he asked. About fifty men saw a black X; not a single one saw the snow-white paper!

Search for the good traits in everyone. Then tell others what you have found. This habit in observation makes everybody feel better. It increases your own cardiac dimensions; it makes the ceiling of your heart a little higher and its walls a little wider; it enlarges your soul. ★ ★ ★

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Electronic analogs — electrical models of physical systems — have proved to be an accurate and efficient tool in

Problem Solving

Denver University Research has inaugurated a new analog computer service that industry is finding useful

David R. Miller

USE of scale models and analogies in the solution of complex physical problems is a method with origins in antiquity. Until recent years, however, application of this technique was seriously restricted due to the difficulties generally encountered in generating appropriate models. Often the only apparent analogy was a direct-scale model whose construction was prohibitively time consuming and costly, particularly if provisions for changing problem parameters were desired.

Electronic Analogs

Within the last two decades, development of the general-purpose electronic analog computer has made possible full utilization of the analogy method for problem solution. The computer does not of itself actually "solve" problems, but is a device of great flexibility that permits easy construction of electrical models of physical systems, either directly or from the mathematical statement of the problem.

In the electrical model, or computer analogy, actual problem variables are represented by varying voltages that can readily be measured and recorded. By observing the behavior of the "analog," useful information concerning the situation under investigation may be obtained, and in this sense the problem is solved.

It is important to note that the computer does not in any degree lessen the human skill required to cope with modern problems. It is, however, an advanced tool in the hands of a capable engineer, mathematician or scientist, and is proving invaluable in advancing the frontiers of human knowledge. The success of computers is amply attested by their wide use and acceptance in many fields and by the meteoric growth of the youthful computer industry.

Analog Operations

All general-purpose electronic analog computers have basic similarities in spite of strongly divergent philosophies of computer design. Common to all is the high-gain d-c amplifier, the fundamental unit of analog computation. The input and feedback impedances used with the amplifier determine the mathematical operation the unit will perform.

Fig. 1 shows the networks used to obtain the elementary linear functions of addition, multiplication by a constant, and integration. Using block-diagram methods, these three operations are adequate to solve ordinary linear differential equations with constant coefficients. The technique is to solve the equation algebraically for the derivative of highest order. Successive integrations of this term yield derivations of decreasing order and finally the desired dependent variable itself. The method is illustrated for the case of a simple, second-order differential equation in Fig. 2 (a), and Fig. 2(b) shows the computer setup that follows directly from the block-diagram solution of the problem. All linear problems can be treated by extending this method.

Non-linearities are easily represented by using non-linear electrical elements such as diodes, in conjunction with the computer amplifiers. Limiting, dead space, raising to integral and fractional powers, and hysteresis are among the non-linear operations generally available in analog computers. Other important operations the computer provides are arbitrary function generation, and multiplication and division of one variable by another. It is a difficult problem indeed that can withstand a team of experienced specialists using a modern analog computer with its operational arsenal.

The differences in computer design philosophy mentioned earlier are manifest in two areas: Computer operating speed and in physical layout and arrangement of the computing elements.

Operating Speed

The frequency range of the d-c amplifiers establishes the speed or speeds at which the computer may properly be operated. A high-speed, or repetitive, computer reproduces the solution a sufficient number of times per second to view the result (without flicker) on an ordinary oscilloscope. A major advantage of repetitive computation is that results of changes in problem parameters are immediately evident, so that exploratory or optimalizing studies are greatly facilitated.

A slow computer (often incorrectly identified as a real time computer) usually operates below 10 cps due to frequency limita'ions of its elements. Solutions must be read out on direct-writing instruments, which gives the advantage of a permanent record. Slow computers are generally built to produce greater accuracy than the repetitive types.

Physical Arrangement

Even a casual glance at the literature available from manufacturers of commercial computers reveals major differences in physical arrangement.

One popular method is to mount

How a D2 fits into your spread

THE efficient, versatile CAT* D2 Tractor is an ideal unit for pipe-line work in confined quarters or on busy city streets. Not only is it extremely maneuverable, but it is designed to give you high production.

Gragg Canada, Ltd. of Toronto is using a D2 with a No. 2A Bulldozer on a 21-mile natural gas line of Consumer Gas Co. in metropolitan Toronto. It is being used principally for backfilling.

Texas Allen, general manager, says, "This machine stands up well under very rough working conditions."

It is engineered to give you top performance—from track bolts to drawbar pins. The D2 has aluminum alloy main and connecting rod bearings; heavy-duty track rollers; heat-resistant alloy steel valves, high-strength "Zerol" bevel gears; a rugged five-speed transmission. In any climate, you can be sure the D2 will start when you need it because it has the exclusive Caterpillar all-weather starting engine.

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Behind the D2—like all Caterpillar-built equipment—stands an army of expert service personnel. You'll find them, and complete parts and service facilities, wherever the pipe takes you.

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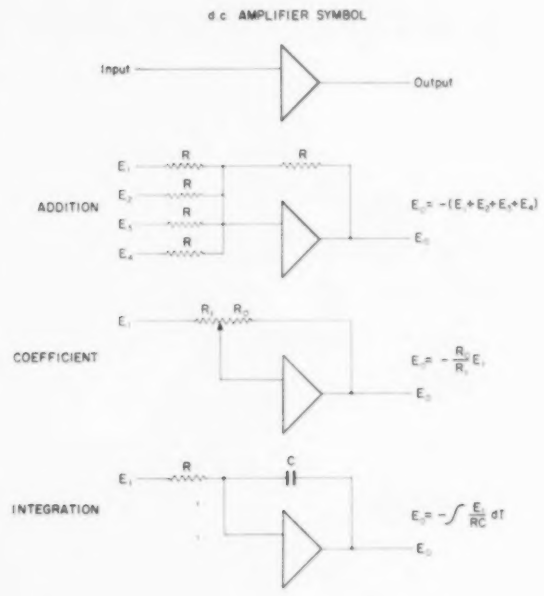

FIG. 1.

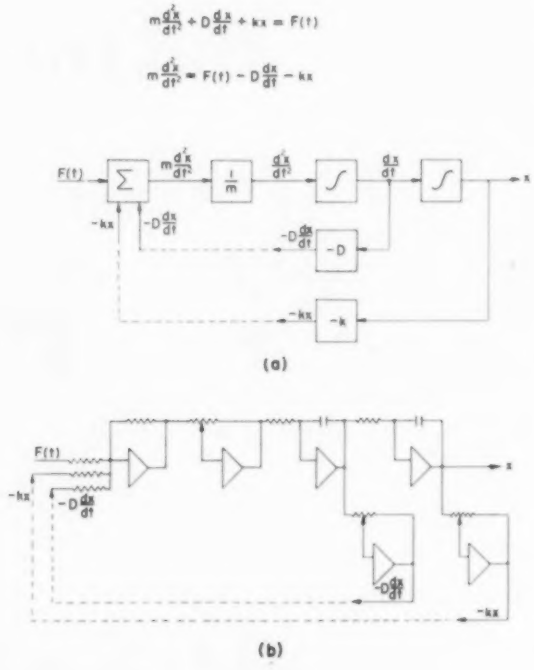

FIG. 2.

permanently in a cabinet amplifiers and all the elements, to be used in setting up computing networks. All terminals are brought to a central patch bay and the networks and problem connections are patched up on problem boards. To reduce the number of connections to be made on the board, some manufacturers free certain elements from the cabinet, notably decade resistors and capacitors, so that they may be plugged directly into the problem board.

Another design, in which the patch bay is entirely eliminated, treats each amplifier with a chosen computing network as a unit. These units can be rearranged in any manner desired. A major advantage of this design is that it makes unnecessary the construction of computing networks by the computer operator, who merely selects the proper unit to perform the required operation. The selected units are then interconnected according to the problem-block diagram.

Some Specific Applications

The analog computer today serves not only as a computational tool to obtain solutions to sets of differential equations, but also as a real time simulator of a great variety of physical devices and systems. It is perhaps in this latter capacity that analog computers

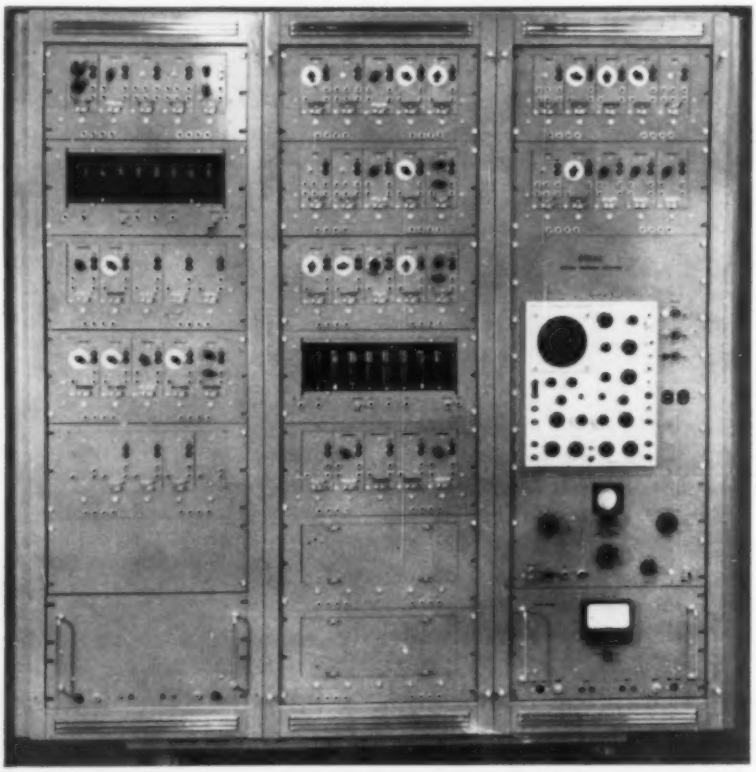

FIG. 3. View of DRIAC, the Denver Research Institute's Analog Computer.

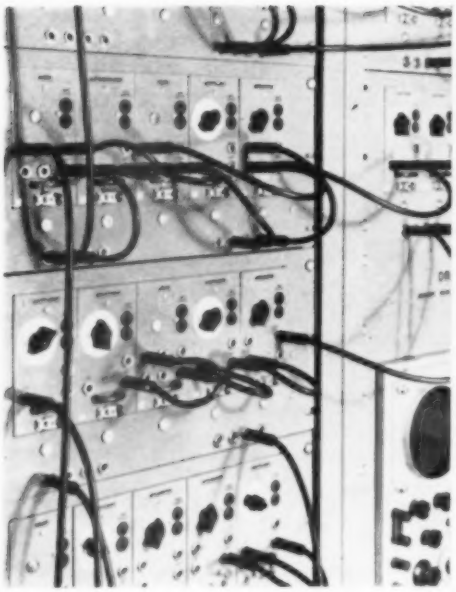

FIG. 4. Part of a typical problem setup on DRIAC.

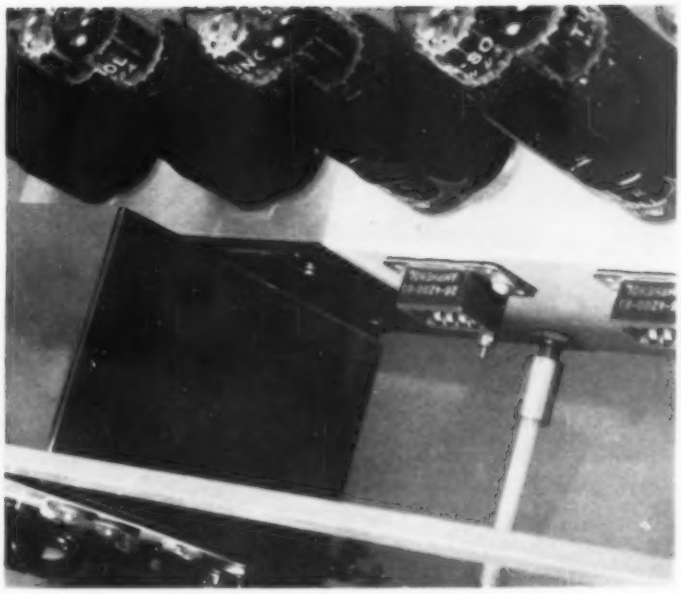

FIG. 5. Downward angle shot of d-c amplifier (top) mounted on a chassis behind front rack panel. A network to perform a specific mathematical operation is plugged into the amplifier in the left foreground.

find their greatest industrial application. In the field of automatic control, systems have been developed involving costly and dangerous devices, without excessive cost or danger to personnel, through the use of analog computer simulation. Reactor controls, for example, are exclusively developed using reactor simulators, for rather obvious reasons.

Jet engine control development leans heavily on engine simulators due to the great cost saving over actual test stand operation. Often, the procedure is reversed and the control system is represented by the computer, making possible control studies that would be prohibitively costly and time consuming if actual prototypes had to be built.

Computer utility is not confined to the control field. In addition to the more or less routine applications in science and engineering, problems occurring in widely separated fields such as biology, aerodynamics, economics, sanitation engineering and military science have been successfully undertaken with analog computers.

Obtaining Computer Services

A second glance at computer literature will reveal that computers vary as widely in price as they do in appearance. This is largely due to the unfortunate fact that in analog computers, cost of manufacture increases exponentially with increasing accuracy. However, for problems where solutions within normal engineering tolerances are acceptable, a very inexpensive computer will often perform as capably as the costliest. Decisions as to form, accuracy and speed are usually in part determined by the use to which the computer is to be put. Ideally, of course, a true general purpose computer would be sufficiently flexible to satisfy any reasonable requirements.

While many industrial and scientific organizations have their own analog computing facilities, many others are not so equipped. In most of these instances, the computational load does not justify the expenditure necessary to acquire a computer. However, the benefits of analog computation need not be confined to groups that own computers. Computational laboratories whose services are available to anyone on a rental basis are located throughout the country.

The Author

David R. Miller, a native of Pennsylvania, received his BA degree from Goshen College in 1948, and his MA degree in mathematics from Denver University in 1951. During 1945 and 1946, he was employed as a technician in the research laboratories of C. G. Conn, Ltd., in the development of electronics instruments and magnetic recording devices. He has taught mathematics and physics in the public schools of Indiana and Texas.

In 1952, he became research mathematician in the basic research and development department of Bendix Products Division of Bendix Aviation. He is co-inventor of a multi-loop control switching system. Miller joined the Denver Research Institute staff in 1954, where he supervised the design and construction of DRIAC.

Recently Miller resigned from DRI and joined Beckman Instruments in Richmond, California, as senior computer applications engineer.

Computing at DRI

Among the newer computing facilities, and unique in the Rocky Mountain area, is the analog computer laboratory of the Denver Research Institute. DRI, the non-profit, applied research department of the University of Denver, also operates a digital computing lab as a part of its many specialized research activities, and through these facilities is able to make modern machine computation available to all but the most modest industrial budget

DRIAC

The Denver Research Institute Analog Computer was designed and constructed in DRI's electronics division specifically to meet the requirements of a general-purpose computer laboratory. A photograph of DRIAC is shown as Fig. 3, and a typical problem setup is illustrated in Fig. 4.

The famed Philbrick K2-W amplifiers are used throughout the computer. These amplifiers, purchased from George A. Philbrick Researches, Inc.,

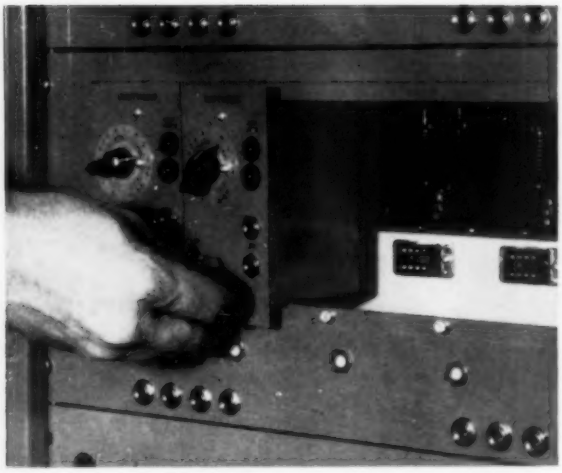

FIG. 6. View of coefficient unit being plugged into amplifier.

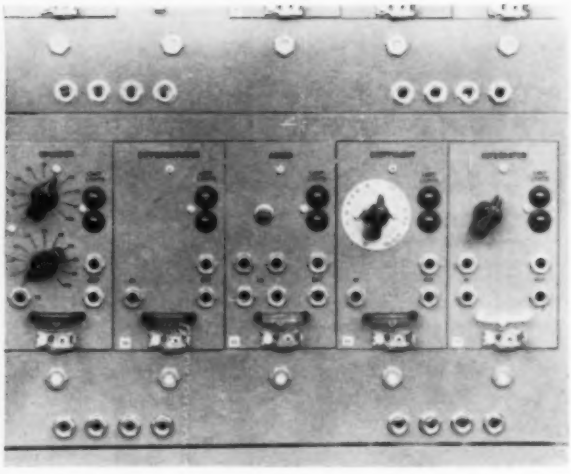

FIG. 7 Random group of computer boxes in position.

Boston, Massachusetts, have a well-authenticated ability to operate throughout extreme ranges of time scale. Use of the K2-W amplifier means that DRIAC can be employed both as a repetitive computer and as a real time simulator for problems ranging from slow-process type systems to certain areas of electronic circuitry. There are 45 amplifiers in the computer. Each of these may be used with a variety of networks to perform linear and non-linear operations. Multiplication and division of variables is possible with any of four channels of the computer's all-electronic multiplying units.

There is no problem board or central patch bay in DRIAC. Each d-c amplifier is mounted on a chassis behind the front rack panel, with its electrical connections terminating in an eight-pin receptacle, as shown by the photograph in Fig. 5. Networks for use in conjunction with the amplifiers to perform a selected mathematical operation are built into boxes that plug into the amplifier in the manner illustrated in Fig. 6.

These boxes are completely interchangeable, and in normal operation are arranged to correspond as closely as possible with the block-diagram solution of the problem. In the example of Fig. 2, the block diagram of part (a) serves immediately as a computer diagram for DRIAC. It is this correspondence with the block diagram that makes the computer easy to set up and check out, a property that becomes more valuable as problem complexity increases.

In Fig. 7 can be seen a random group of computer boxes. It is notable that in DRIAC there is no correction necessary for potentiometer loading effects, so the coefficient boxes have direct-reading dials, calibrated accurately from 0 to a gain of 100. The switch on the integrator box changes the computer time scale. The computer operates from self-contained, well-regulated power supplies, and initial conditions are obtained from a built-in function generator with a frequency range from .01 to 1200 cps.

All problems must be scaled before they are set on the computer. Scaling is the process of establishing ratios between voltages in the computer and corresponding variables in the problem. When the computer operates in a time interval different from that of the problem under study, time must also be scaled. For problems that are linear throughout, scaling is relatively simple. However, when non-linearities must be included in the analog study, scaling becomes increasingly difficult, and in some cases problem preparation may represent the major part of the cost of problem solution.

In certain problems, a solution is desired for only one set of coefficient values, in which case the answer is available within minutes after the problem is plugged into the computer, and total use time of the computer may be less than one hour. Other problems require extensive study of the effects of variations in problem parameters. Such studies may require weeks or months of computer time.

Training of Client Staff

As the computer representation of a physical problem is a true analog or model of that problem, technical personnel working with it gain a new feeling and insight through manipulations of the analog. For this reason, the Denver Research Institute encourages technical personnel of the problem-sponsoring client or group to participate in the setup and operation of the computer.

Instead of merely submitting equations to be solved, the contractor may, if he wishes, send his own people to work jointly with DRI personnel in conducting the computer study in order to derive the greatest value from the evaluation and interpretation of the obtained solutions. DRIAC was designed to permit personnel previously untrained in computer techniques to participate successfully in a computer study after a brief period of instruction.

Cost

Actual cost of having a problem solved by the analog computer laboratory is dependent on a number of factors. Basically, of course, it is the complexity of the problem and the extent of the computer investigation desired that ultimately determine the cost. The services of DRIAC and a minimum computer staff can be secured for less than $15 per hour. Additional personnel requirements would increase this rate somewhat, but in cases where the contractor's technical staff participates in the computer work, computer personnel beyond the minimum staff are seldom needed.

Whatever the cost, whether $20 or $20,000, experience throughout industry has been that money spent in computer studies is well spent. Months or even years of laborious computation and experimentation can be replaced by a few hours work in a modern computer laboratory. Analog computers have proved invaluable to many firms, and the application of so successful a tool deserves the careful consideration of any group dealing with problems in the physical realm. * * *

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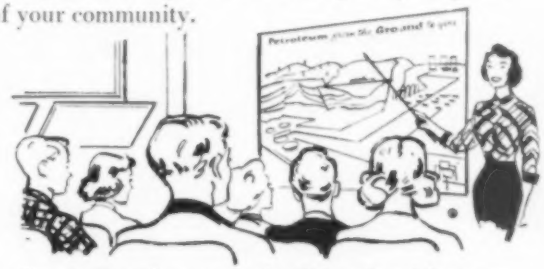

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MAGNET COVE BARIUM CORP., Houston, Tex.—Magcobar* and Magcogel* drilling muds and other specialized oil well drilling fluids and chemicals.

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PACIFIC PUMPS, INC., Huntington Park, Calif. — Centrifugal pumps for refineries, power stations, pipelines, and chemical plants; plunger pumps for oilwells.

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ROOTS-CONNERSVILLE BLOWER DIVISION, Connersville, Ind.—Rotary positive blowers, gas pumps, centrifugal blowers, exhausters, vacuum pumps, and positive displacement meters.

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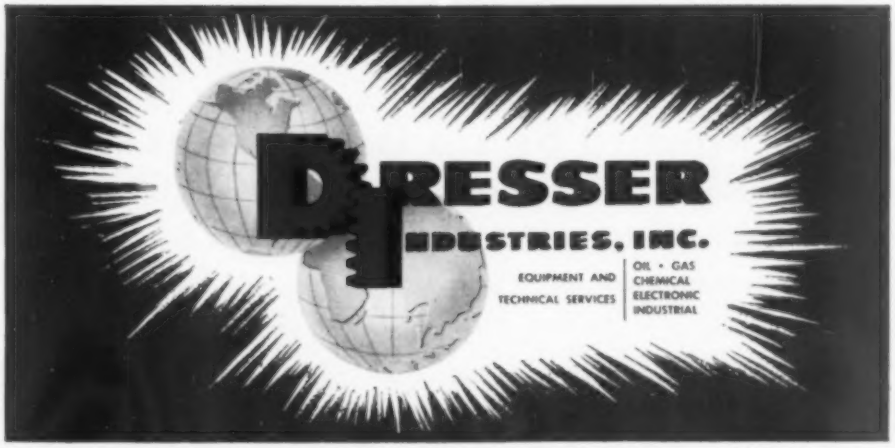

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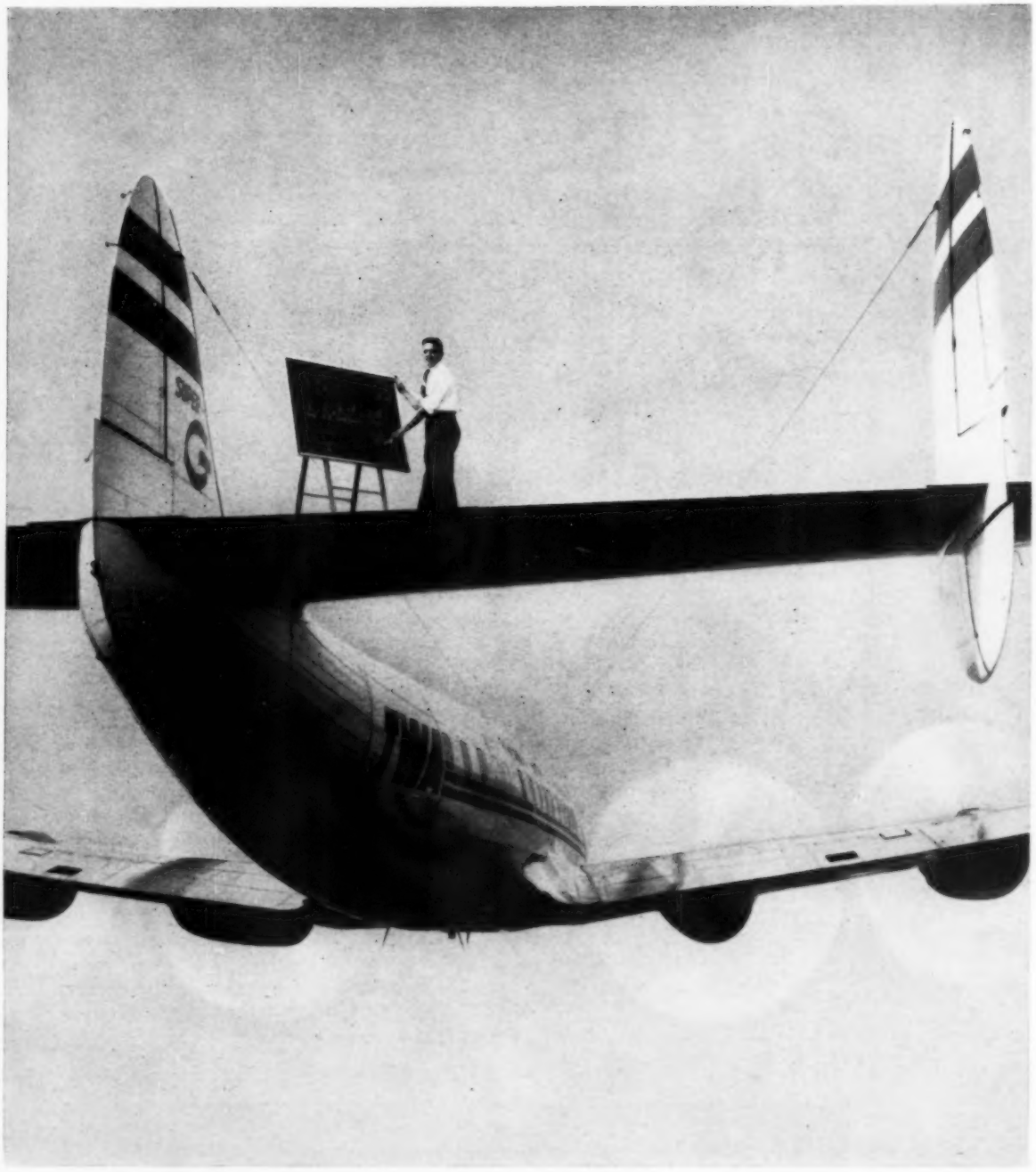
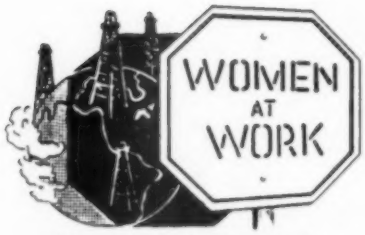


Oilmen should be up in the air! An oil company physicist and his slate of equations may seem out of place in the sky. But airmen couldn't get off the ground without oilmen. Oil helped fly 50 million passengers on U. S. air lines last year. And oil company researchers are developing jet and rocket fuels that will shrink tomorrow's world even more. Remember these things when you hear misinformed people speak against your industry. Speak up—tell how you help give America wings! **SHELL OIL COMPANY**



'Corporate Watchdog'

Shorthand from her stenographer days is still valuable to **Alice Bartles,** now assistant corporate secretary of Esso Research and Engineering Company. When it comes to boiling down the "meat" of high-level policy discussions during meetings of the board and executive committee, Alice says that shorthand certainly comes in handy.

But being responsible for the minutes of these sessions is only a fraction of Alice's job. As a team, she and Secretary Philip Young serve as "corporate watchdog" to insure that the company's legal obligations as a corporation are never breached. They have custody of the company's official records and documents, handle all announcements of organizational and policy changes, and file the necessary legal papers whenever a change affects the corporate structure.

Is there anything unusual about her job? According to Miss Bartles, it's *all*

Alice Bartles

unusual, with something different happening each day. One of these different somethings is the channeling of ideas for inventions submitted by outside inventors. Another is attending the annual stockholders meeting—a gathering of only two persons. Alice, with a proxy signed by the lone stockholder, parent Jersey Standard firm, and Esso Research's executive vice president.

Alice works in the Manhattan headquarters office but lives in a Long Island suburb far enough out to require a 30-mile drive to and from the subway each morning and night. Her interests include her home, her garden and three pets—two cats and a purebred poodle.

Take Investment Course

The New York Chapter of the Desk and Derrick Club is taking a 9-week lecturing course in securities and investing. The course is sponsored by the Investors' Information Program of the New York Stock Exchange.

Objectives of an investment program, interpretation of financial reports, sound methods of investing, and advanced and speculative investing techniques are some of the topics covered by the lecturers who were selected by the Investors' Information Program's Speakers Service.

Mr. Ruddick C. Lawrence, vice president in charge of Public Relations and Market Development of the New York Stock Exchange said in a statement to the Desk and Derrick Club: "We are delighted to know there is such interest among the women in the oil industry in knowing more about the Stock Exchange and sound principles of investing.

"We hope more institutions and companies will sponsor lecture series like this so that we will have a real 'people's capitalism.' It would be a perfect answer to many of the 'isms' which challenge our American economic system."

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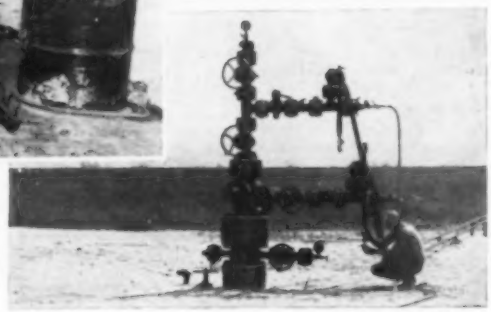
Injection Pumping Unit for Anti-Corrosion Tubing Treatment



This interesting injection unit, shown here "on location" near Grand Chenier, La., is mounted on the stern of a boat for convenient servicing of 32 oil wells along the waterway . . . designed to prevent or minimize corrosion to casing and tubing where surface pipe is immersed in salt water.

Chemicals are forced into the tubing under high pressure which must exceed the well pressure. The "Christmas Tree" assembly shown above is receiving the full treatment under 6100 lbs. pressure, which is supplied by a Model AEN Wisconsin Single Cylinder Heavy-Duty Air-Cooled Engine.

This Wisconsin-powered pump and chemical storage unit, built by McFarland Engineering & Pump Co., Houston, Texas, again demonstrates the unlimited versatility and rugged dependability of Wisconsin Engines in oil field service. Wherever the job calls for High Torque Performance and practically foolproof maintenance, Wisconsin Heavy-Duty Air-Cooled Engines carry the load on every type of power assignment that can be handled in a 3 to 36 hp. range.

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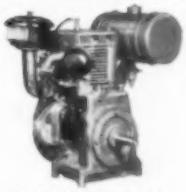

Model AEN 4-cycle single cylinder Wisconsin Heavy-Duty Air-Cooled Engine. 4.5 to 8.25 hp., 1600-2200 rpm.

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PERSONALS

M. J. Rathbone, president of Standard Oil Company (New Jersey), was given the Stevens Honor award for his notable achievement in the oil industry. The presentation took place in February at the annual dinner of the Alumni Association of the Stevens Institute of Technology.

Gerald F. Bassler, Houston, Texas, was promoted to director of personnel development for Continental Oil Company. He formerly was director of training for Conoco's manufacturing department.

Dr. William P. McKinnell, Jr. has joined the staff of the engineering section of the Ohio Oil Company's research center. He received a bachelor's degree from the University of Minneapolis and a master's degree from Missouri School of Mines, and was graduated last year from Ohio State University with a PhD in metallurgy.

H. H. Sharpe III was named senior district representative in New England and **Robert E. Harris** senior district representative in Great Lakes area of OIC.

B. T. Willey, Continental Oil Company, is the new executive vice chairman, Kansas-Oklahoma district of OIC. **Russell D. Karns,** Pan America Petroleum Corporation, is chairman.

James L. Sewell, president of Delhi-Taylor Oil Corporation, was appointed chairman of the Texas OIC.

Dr. John E. Kasch was elected vice president and member of the board of directors of American Oil Company. He formerly was manager of research and development.

The board of directors of the Association of Desk and Derrick Clubs of North America met in Dallas, January 25-27. Present were: First row: Lavada Clayton, secretary, Gulf Oil Corporation, Wichita Falls, Texas; Florynne T. Brandon, treasurer, Cecil V. Hagen, Houston, Texas; Irma Cline, president, Nelson, Montgomery, Robertson, and Sellers, Wichita Falls, Texas; Edna Hurry, 1956 president, Standard Oil Company (New Jersey), New York; Maxine R. Hacke, first vice president, Warren Petroleum Corporation, Tulsa, Oklahoma; and Betty Todd, second vice president, Brinkerhoff Drilling Company, Denver, Colorado. (Back row): Gladys Watford, Ralph A. Johnston, Houston, Texas; Helen Little, The Carter Oil Company, Oklahoma City, Oklahoma; Polly Lamkin, Sun Oil Company, Denver, Colorado; Eunice Wilder, Esso Standard Oil Company, New York; Ann Pringle Rule, Socony Mobil Oil Company, Detroit, Michigan; Lois Lewis, Independent Refiners Association, Los Angeles, California; Judith Hathaway, Plantation Pipeline Company, Atlanta, Georgia; and Mary Katherine Nabours, Cree Production Company, Abilene, Texas.

The 1957 annual meeting will be held August 30-31 at the Hilton Hotel in Chicago, Illinois.

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As a result of a test installation some time ago, a fleet operator standardized on DeZurik Plug Valves for this punishing service. He reports that DeZurik Valves consistently *outlast* and *outperform* any valves he had used. They maintain 100% seal, still open and close easily despite the high sand content, and have an effective life three to four times that of ordinary valves.

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Oil Financing from the **FIRST** *in* **DALLAS**
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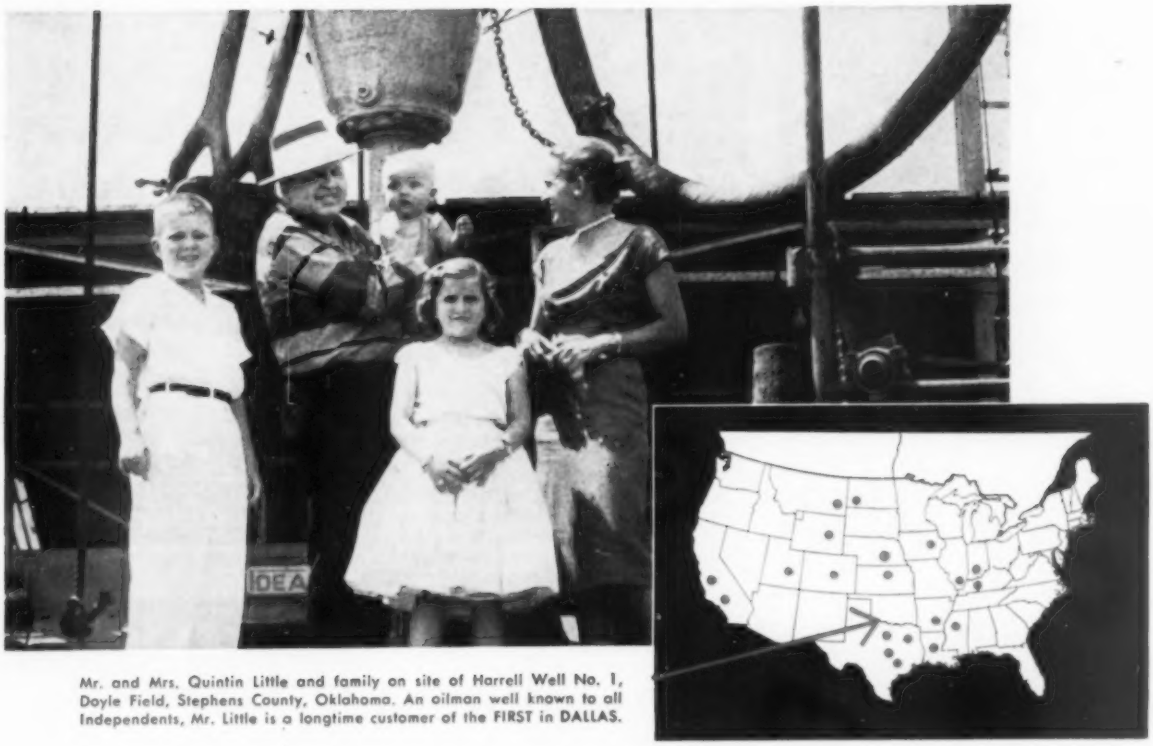

Mr. and Mrs. Quintin Little and family on site of Harrell Well No. 1, Doyle Field, Stephens County, Oklahoma. An oilman well known to all Independents, Mr. Little is a longtime customer of the FIRST in DALLAS.

Specialized experience, organization, and resources to help you with practically any kind of need for "working money".

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Member Federal Deposit Insurance Corporation

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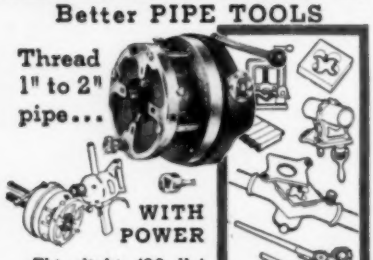
ARMSTRONG BROS.
Better PIPE TOOLS

Thread 1" to 2" pipe...



WITH POWER

This light (26 lb.) compactPortablePower Pipe Threader, goes to the job—is operated with a ½" portable electric drill. 1 set of High Speed Steel Chasers do all sizes—just move indicator to 1", 1¼", 1½", or 2" marking. Clamp on pipe and apply drill to drive square. The rest is automatic. Operating on anti-friction bearings with automatic lead, it's a fast, easy way to get smooth, accurate threads.

Write for Catalog

ARMSTRONG BROS. TOOL CO.
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▸ **Harvey Cash,** assistant to the chairman of the board of The Texas Company, was elected to the board of directors of Seaboard Oil Company, replacing **R. F. Baker** who resigned upon his retirement from The Texas Company.

▸ **Fred F. Florence,** president of the Republic National Bank of Dallas, Texas, was elected chairman of the executive

F. F. Florence

J. W. Aston

committee and chief executive officer of the bank, and **James W. Aston,** executive vice president, was named president and a member of the board of directors.

▸ **Elmer O. Mattocks** was appointed director of the department of technical services of the API. He has been assistant director for the past several years and succeeds **David V. Stroop,** who now will devote all of his time to his duties as executive assistant to the president.

▸ **Oscar John Dorwin** has been elected a director and **Theodore A. Mangelsdorf** a vice president of The Texas Company.

Dorwin was a vice president and general counsel. As a director, he will replace **R. F. Baker,** executive vice president of the company, who retired.

▸ **Charles E. Starr, Jr.,** who has been public relations manager and was previously an assistant director of research, was appointed to the new post of manager of the new technical and public information division for Esso Research and Engineering Company. **William T. Knox,** an assistant research director with Esso Research, was named director of the technical information division. **William M. Craig** was promoted from assistant director to director of the public relations division. **Gordon Duncan,** formerly assistant manager of the office of scientific liaison, was named assistant director of technical information. **Howard Tate** was appointed consultant to the technical information division.

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BEAR, ELK, BUFFALO, VENISON
Game in season deliciously served in a way that HAS WON US FAME . . .
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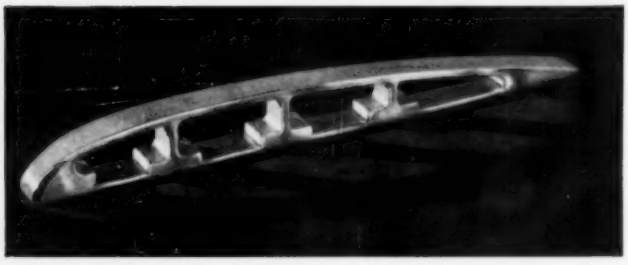

Cross section shows structural superiority of Aeromaster's new, extruded aluminum-alloy blades in diameters from 9' to 22'.

NEW! EXTRUDED ALUMINUM Blades on AEROMASTER* fans only

AEROMASTER'S new, extruded aluminum blades combine in one design the advantages of a light weight metal, a hollow structure and the superior strength of wrought metal . . . Silicon-magnesium aluminum alloys resist corrosion. Their fine grain structure, high tensile strength and increased endurance limit eliminate danger from wear, vibration, and metal fatigue . . . true airfoil blade sections assure maximum air delivery . . . adjustable blade pitch angle permits decrease of fan load to an accurate minimum horse-power requirement.

The AEROMASTER fan is easily assembled *in the tower.* No special handling equipment is necessary. AEROMASTER fans cost less to install, less to operate, less to maintain!

For more details write to KOPPERS COMPANY, INC., Aeromaster Fan Dept., 6703 Scott Street, Baltimore 3, Maryland.

KOPPERS Aeromaster Fans
Engineered Products Sold with *Service*

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. . . to get peak performance longer, Cooper-Bessemer is now factory-installing STITT New Triple Ignitor Spark Plugs. STITTS last up to 10 times longer, cut downtime, increase magneto life. Also factory equipment in other leading oil field engines.

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STITT MAKES HEAVY-DUTY, INDUSTRIAL-TYPE PLUGS!

Charles A. Schrader was named vice president for supply and transportation at Leonard Refineries, Inc. He was formerly president and director of Michigan-Ohio Pipeline Corporation in Mt. Pleasant, Michigan.

Ralph G. McIntyre, chairman of the board of Standard Oil Company of Texas, and president of Pasotex Petroleum Company and Pasotex Pipe Line Company, retired after being associated with the parent company, Standard of California, and its subsidiaries for over 46 years. A banquet was given at the Houston Club for the McIntyres by some 40 Houston key employees honoring his retirement.

R. G. McIntyre

Russell D. Richardson was elected treasurer of Tidewater Oil Company in addition to his present responsibilities as controller. He has been with the company 36 years.

L. G. (Gayle) Rodgers, general manager of the gas division of the Sunray Mid-Continent Oil Company's production department, was granted a one-year leave of absence to serve with the oil and gas division of the U. S. Department of the Interior in Washington, D. C.

H. A. Stewart, director of the Interior Department's oil and gas division, said Rodgers was requested by the government to serve as commodity industry analyst with the operating title of refining technologist.

DEATHS

Carroll H. Tuttle, 65, recently retired from the Standard Oil Company of California, died of a heart attack January 14.

Six persons were killed in the crash of a Sohio Oil Company airplane January 25: **Bob Pomeroy,** the pilot; **Jim Thornton; Mr. and Mrs. Donald Crary,** and **Mr. and Mrs. Clyde Thompson,** all of Oklahoma City, Oklahoma.

Kurwin Robert Boyes, secretary of the American Gas Association for 31 years, died suddenly January 30 at the age of 60.

Samuel G. Keller, 65, a refinery manager of Socony Mobil Oil Company, Inc., until his retirement last year, died February 1.

Bill Buster Collins, district sales manager in Tulsa, Oklahoma, for Standco Brake Lining Company, Houston, Texas, was fatally injured in an automobile accident.

Dr. Ferdinand W. Breth, vice president and technical director of L. Sonneborn Sons, Inc., died January 8 of a heart attack.

Iley P. "Crip" Payne succumbed suddenly to a heart attack January 14. He was manager of sales, construction equipment division, International Harvester Company.

George F. LeBus, Sr., Wichita Falls, Texas, died December 29. He was founder of the LeBus Rotary Tool Works. He suffered a heart attack.

Edward J. Nolan, 68, Houston, Texas, oil man and former president of the Bank of America in Los Angeles, California, died February 4.

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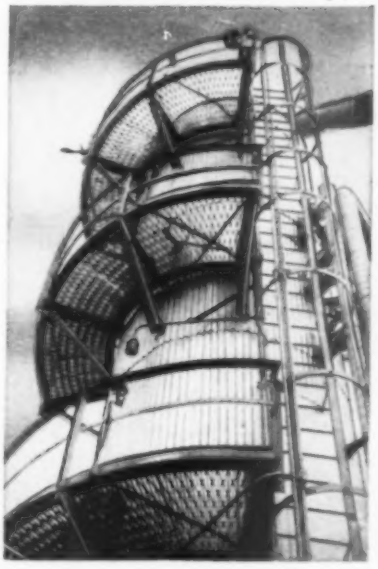
RAIN OR SNOW CAN MAKE CATWALKS DANGEROUS



Walkways, catwalks and treads made of solid wood, metal or other material can collect snow, rainfall, grease or oil and become dangerously slippery.

But these walking surfaces, made of an open mesh of metal bars on edge, cannot collect these substances, leaving the surface always clean, dry and tractional for safer access to high places.

As founders of the grating industry, the Irving Company can draw upon over half a century of experience to supply you with quality grating products for catwalks, treads and other practical and economical uses.

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LAUGH with BARNEY

An important-looking individual rushed up to the box office. "I want two tickets for tonight's show," he said.

"Sorry," responded the ticket seller. "We simply haven't a seat left — only two standing room."

"Only two standing room, eh," the prospective purchaser meditated. Then he queried, "are they together?"

Many a man keeps his nose to the grindstone so his wife can turn hers up at the neighbors.

"Your husband looks like a brilliant man. I suppose he knows practically everything."

"Don't be silly. He doesn't even suspect anything."

Sign in the window of a launderette: "Ladies who care to drive by and drop their clothes will have prompt and courteous attention."

Everyone likes to see a broad smile—especially if she smiles at him.

The tired clerk had pulled down blanket after blanket until only one was left on the shelf. Then the customer remarked: "I don't really want to buy today. I was looking for a friend."

"Well, Madam," said the clerk, "I'll take down the last one if you think he's in it."

It was the little girl's first day at school and the teacher was making out her registration card.

"What is your father's name?" asked the teacher.

"Daddy," replied the child.

"Yes, I know, but what does your mother call him?"

"She doesn't call him anything. She likes him."

Small Bobby was playing on the back porch when suddenly there was a great clattering and banging out there.

"Bobby," called his mother, "what are you doing?"

"Nothing," he answered. "Nothing at all."

"What are you doing it with?" demanded his mother.

A small voice answered: "With a hammer."

"Doctor, this is Mr. Smith. My wife has just dislocated her jaw. If you're out this way within the next two weeks you might drop in."

The judge looked down at the sweet young thing. "You claim that the defendant stole your money from your stocking?" he asked.

"That's right, your honor," she answered.

"Well, why didn't you resist?" the judge asked.

The girl blushed and lowered her eyes. "I didn't know he was after my money, your honor," she answered.

"I guess I've lost another pupil," said the professor as his glass eye rolled down the sink.

When the salesman walked into the hotel he noticed a very pretty blonde sitting in an easy chair. An exchanged look, a smile, a nod, and they walked over to the desk. The man registered "Mr. and Mrs. Jim Jones."

The next morning when he checked out he was presented with a bill for $385.

"What!" screamed the outraged guest. "I only stopped here one night!"

"I know," replied the clerk, "but your wife has been here for eight months."

She was "Honey Chile" in New Orleans,
The hot spot of the bunch;
But on the old expense account
She was gas, cigars, and lunch.

The youngster wolfed his dinner while father looked on disapprovingly. Finally the not-too-proud parent spoke: "Jimmy, you're a pig. You know what a pig is, don't you?"

The small-fry looked up and replied complacently, "Yup, a pig is a hog's little boy."

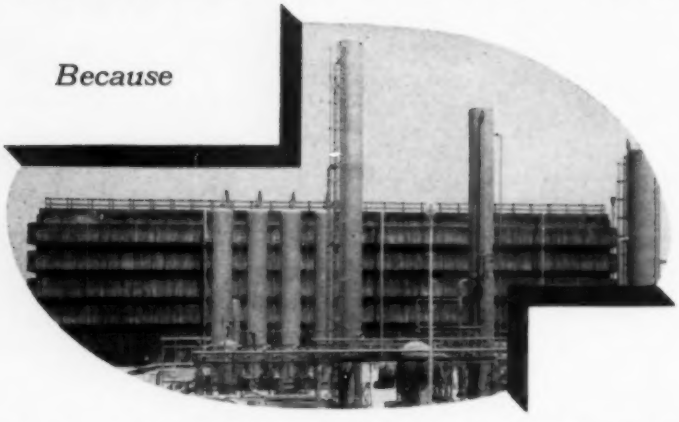
Stenographer: "Your little girl wants to kiss you over the phone."

Busy engineer: "Take the message, I'll get it from you later."

First Inmate: "And what are you doing now?"

Second Inmate: "Buying old wells, sewing them up and selling them for post holes."

Your Plant Water Systems
MORE EFFECTIVELY PROTECTED



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A difference which can be used to your advantage is present in the chemical composition and behavior of Haering's Organic Chrom Glucosates*.

A Chrom Glucosate* inhibitor film is tough, tenacious, elastic yet adherent, self-sealing and impervious. Is particularly effective in waters with high sulfate and chloride contents** where process streams introduce various complex reducing contaminants. The organic Glucosates are used at low dosage rates over wide ph range. No more expensive and often cheaper to use.

Without cost or obligation find out how "Organic Methods" can provide extraordinary protection to water-using equipment in your plant.

**In use 8 years in a Cooling System where chloride content exceeds 25,000 ppm at times.

*Reg. U. S. Pat. Office

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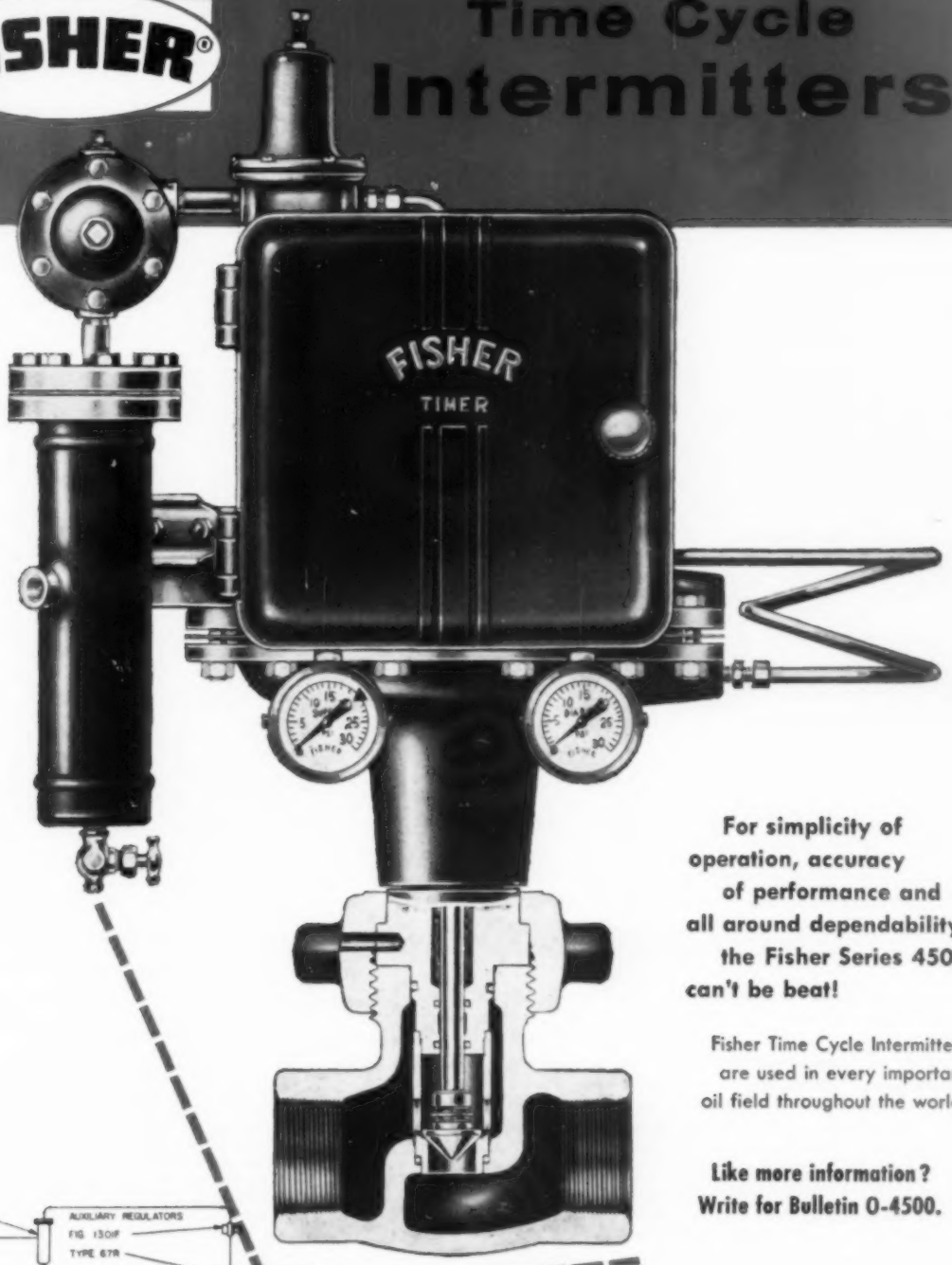
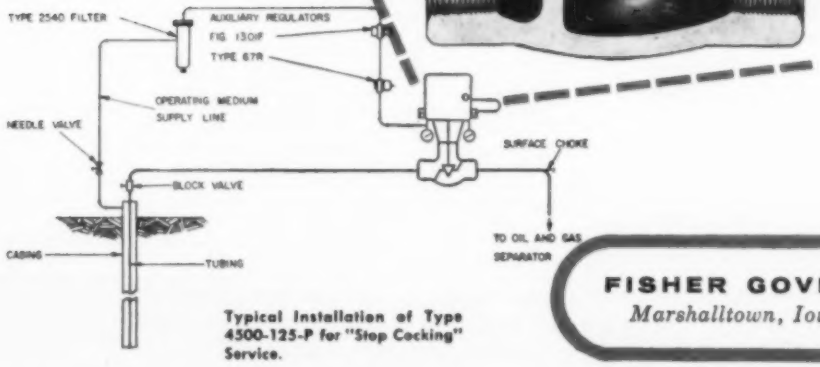


For simplicity of operation, accuracy of performance and all around dependability, the Fisher Series 4500 can't be beat!

Fisher Time Cycle Intermitters are used in every important oil field throughout the world.

Like more information? Write for Bulletin O-4500.



Typical Installation of Type 4500-125-P for "Stop Cocking" Service.

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FOR CONDENSING . . . STEAM . . . VAPORS

HC units by Young are used the world over in oil field applications where dependability of cooling performance is essential . . . this is *where quality counts!* These horizontal core units combine the *efficiency* of vertical air discharge, the *economy* of compact Young design, the *versatility* of multiple unit installations. Built for rugged service, HC units are the result of many years of heat transfer specialization by Young. They are available in a wide range of capacities and services . . . single installations, such as the one pictured above, or in multiple installations of seven basic sizes. Why not call on *specialists* to solve *your* heat transfer problems? Call Young!

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BOOKS ★

Interchangeability of High Btu Oil Gases and Natural Gases, *research bulletin 24, by E. F. Searight, H. R. Linden, D. L. Nichol and E. S. Pettyjohn, published by Institute of Gas Technology, Illinois Institute of Technology, Technology Center, Chicago 16, Illinois, Pages, 59. Price, $5.00.*

Believed to provide an answer to problems faced by distribution companies which must supplement their natural gas supplies to meet peak loads, this study demonstrates the effect of operating conditions and modification with diluents on the substitutability of oil gases. It reports the maximum per cent oil gas in mixtures of oil gas and base natural gas which exhibited satisfactory combustion performance on critical burners and critical and contemporary appliances.

This bulletin reviews and correlates all previously published critical burner data for high-methane and high-inert natural gas adjustments, as well as new critical burner data obtained in control tests during the appliance study.

Equilibrium Moisture Content of Natural Gases, *research bulletin 8, by R. F. Bukacek, published by Institute of Gas Technology, Illinois Institute of Technology, Technology Center, Chicago 16, Illinois. Pages, 19. Price, $3.00.*

Bulletin 8 presents the results of a study of the equilibrium moisture contents of natural gases to provide data essential to the efficient design and operation of equipment involved in natural gas production, processing and transmission.

Results include experimental measurements of the moisture contents of methane, propane, nitrogen, a methane-propane mixture, two methane-butane mixtures, a methane-pentane mixture, and nitrogen-free and high-nitrogen (14.8 per cent) natural gases, at 220 F and in the 1000-10,000 psi pressure range, and a newly-developed correlation for determining the equilibrium moisture content of any natural gas.

Plastics for Corrosion-Resistant Applications, *by Raymond B. Seymour and Robert H. Steiner, published by Reinhold Publishing Corporation, 430 Park Avenue, New York 22, New York. Pages, 421. Price, $7.50.*

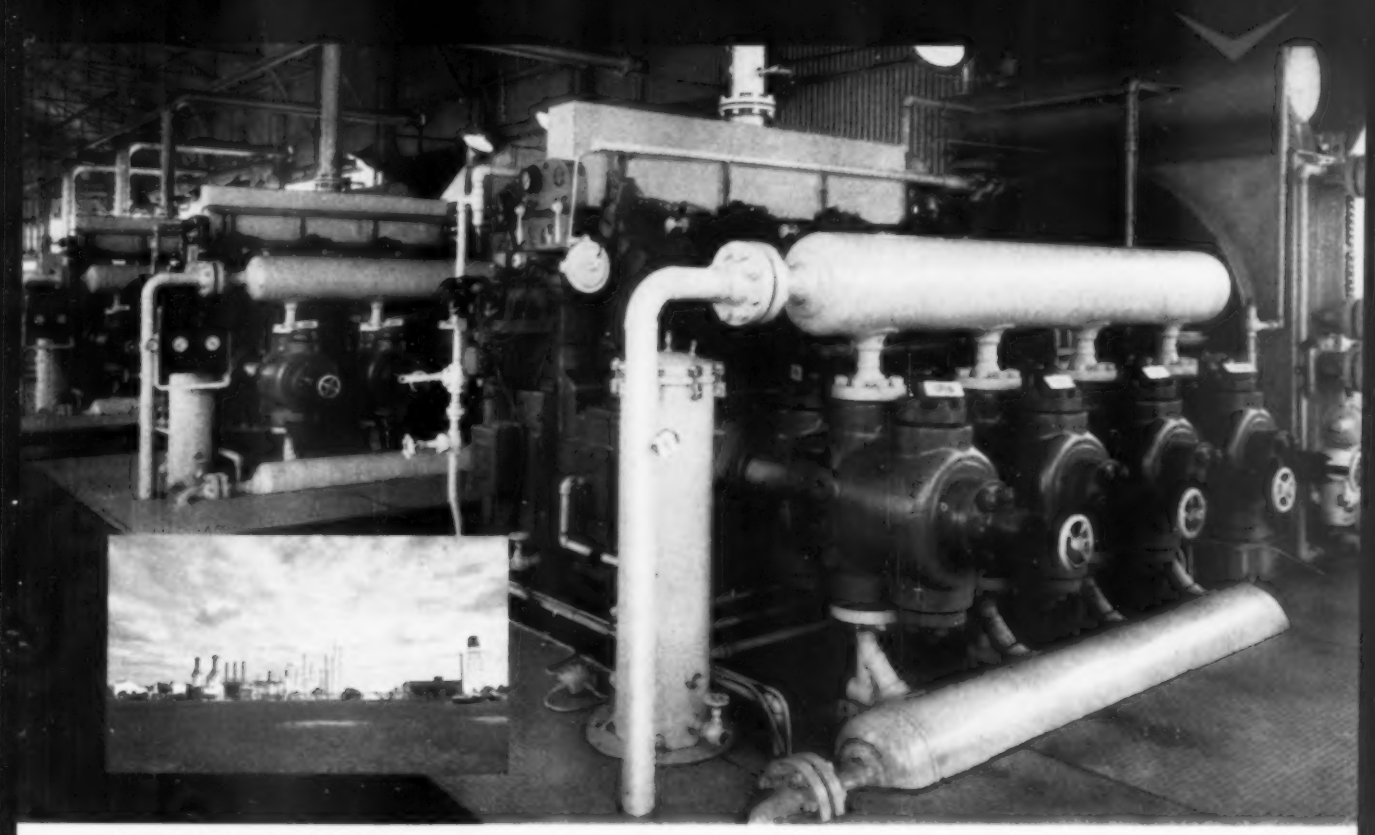
Engineers concerned with the fabrication and use of plastic materials will find the material presented in this book helpful where background information is necessary.

The reader is familiarized with the relationships between the chemical and physical properties and the molecular structure of plastic materials. Various uses are listed for plastics as protective coatings, organic linings, chemical-resistant mortar cements, casting resins, plastic foams, impregnants, industrial adhesives and reinforced materials. Descriptions of duct-work, valves, and fittings, plastic pipe, sumps and processing vessels are given. Comparative data are given on such subjects as chemical resistance of coatings, linings, pipe, and reinforced or thermoplastic structures.

Management for Tomorrow. *8th Annual Conference Proceedings of Society for Advancement of Management, published by Chilton Company, Chestnut and Fifty-sixth Streets, Philadelphia, Pennsylvania. Pages, 179. Price, $6.00.*

A collection of articles about management and the future by some of today's management. Perhaps the best way to review the volume is to give the contents: 1. The Road Ahead, by H. Thomas Hallowell, Jr., president, Standard Pressed Steel Company. 2. Patterns for the Future, by Vernon D. Northrop, executive vice president, Philadelphia Food Distribution Center. 3. Internal Audit — Can It Reveal the Weak Spots?, by G. Raymond Killiam, general auditor, Philco Corporation. 4. Opinion Surveys — Management's Tool for Quality Control in Human Relations, Herbert H. McCarey, management consultant. 5. Developing Managers — Shall They Be Specialists or Generalists?, Merrill E. Kilby, manager, Management Services Organic Chemicals Division, American Cynamid Company. 6. Control by Incentives — Outdated or New Horizons? Herbert T. Smith, manager, Management Services Division, Ernst & Ernst. 8. Control by Incentives — Case History, Howard MacDonald, manager of manufacturing, valve division, Minneapolis-Honeywell Regulator Company. 9. Integrated Data Process — An Aid to Decision Making, J. M. Kalbach, Jr., engineering service division, Engineering Department E. I. du Pont de Nemours & Company. 10. Productivity — Its Meaning — Its Measurement — Its Future, Richard L. Hapgood, senior engineer, Eddy-Rucker-Nichels Company. 11. Management and Labor What are Their Common Goals? J. D. Moore, Moore Organization, Chicago. 12. What to Expect Between Management and Labor, William G. Henry, industrial relations advisor. NMA. 13. The Goals of Management and Labor, Frank C. Pierson, Professor of Economics, Swarthmore College.

BEAIRD-INGERSOLL-RAND Packaged Compressor Plant



Arkansas Fuel Oil Corporation's Panola Gasoline plant equipped with three Beaird-Ingersoll-Rand 220 h.p. 8JVG packaged compressors. Units have Young radiators with lubricating oil coolers and gas after-coolers and all necessary controls for unattended operation. Other sizes 110 to 660 h.p.

Packaged Compressors provide—

FLEXIBLE OPERATION FOR LARGE GASOLINE PLANT

Arkansas Fuel Oil Corporation operates this large gasoline plant in the Panola Field just south of Carthage, Texas. Natural gas processed in the plant is picked up from 18 wells by three Beaird-Ingersoll-Rand 8JVG 220 h.p. packaged compressor units. Boosting 8 to 12 million cubic feet per day the units use one stage of compression to raise the gas from 550 psig input to 1100 psig.

To assure maximum flexibility and continuous operation, Arkansas Fuel Oil installed a number of packaged units rather than one large compressor of equal horsepower. Plant pressures and operations can be maintained, when necessary, by two of the units while the third is shut down for maintenance or repair. This permits plant production to be held to scheduled capacity at all times.

As wellhead pressures drop off the compressors can be changed on location to two-stage operation or additional units can be placed on the line. The operating flexibility of this multiple unit packaged compressor station will prove even more valuable as the field approaches depletion. When no longer needed the compressors can be transferred to other service as complete units with little or no change.

Let us show you how economically Beaird-Ingersoll-Rand packaged compressor plants can be added to your compressor station.

THE J. B. BEAIRD COMPANY, INC.
Shreveport, Louisiana

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BEAIRD FITTINGS...

THE RIGHT TURN FOR SEAGOING OIL!

Weighing twenty six hundred pounds each, these 24″ Beaird cast steel fittings have gone to work delivering Venezuelan oil to waiting tankers. Another example of precision manufacturing from blueprint to finished product, the big cast steel flanged elbow fittings were produced to exacting specifications by Beaird's machining division. One of five divisions serving the oil, gas, petro-chemical and construction industries, the machining division offers its customers the benefits of the integrated facilities and know-how of the entire Beaird production team.

BEAIRD

MACHINING
MANUFACTURING
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The Trade PARADE

Carbide Licenses Patents

Carbide and Carbon Chemicals Company, a division of Union Carbide and Carbon Corporation, has announced the availability for licensing of carbide patents which cover three new instruments for automatically measuring streams of gases and liquids in production processes.

These instruments are a chromatographic analyzer, a differential refractometer, and an electrolytic concentration cell. Carbide is now using them in its own plants and will license instrument makers to produce and sell them to industry.

The chromatographic analyzer can analyze for one or more components of many mixed gas streams heretofore considered too difficult for plant instruments. This analysis is obtained by passing a sample of the mixture through a packed tube. Here the components are separated. The percentage of each gas in the mixture is then registered automatically.

The differential refractometer provides a continuous analysis of liquid streams by comparing the index of refraction of the liquid to a liquid of known index. While it is not expected to be used as extensively as the chromatographic analyzer, its applications will nevertheless be numerous.

The electrolytic concentration cell measures the difference between the ionic concentration of two liquids. This cell is useful in measuring trace amounts of certain gases. Thus far the cell has been used primarily in instruments which are capable of measuring parts per million of oxygen in plant streams.

Corrosion Rectifying Incorporates

Corrosion Rectifying Company, consultants, designers and materials suppliers for cathodic protection systems, has incorporated and moved into a larger office and warehouse in Houston, Texas.

This move is the culmination of five years of growth of the original company, which specializes in designing, installing, and equipping systems for corrosion prevention on pipelines, tank bottoms and interiors, oil well casing, docks, pipings, offshore platforms, ships and barges.

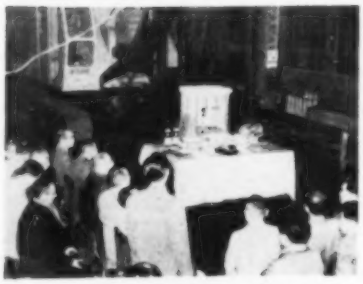
Mexican Sulfur Plant

Negotiations have been completed for construction of a $3,500,000 Frasch process sulfur plant for Central Minera, S. A. by Fish Service de Mexico, S. A. de C. V.

Central Minera, a subsidiary of the Texas International Sulphur Company, owns a 123,000-acre sulfur concession on southern Mexico's mineral-rich Isthmus of Tehuantepec.

Fish Service de Mexico, Mexican subsidiary of Fish Service Corporation, Houston, Texas, is completing geological and engineering studies on the deposits located near the village of Texistepec, Vera Cruz, Mexico.

The proposed new facilities will have a capacity of approximately 1000 tons per day and will cost in excess of $3,500,000. Expected completion date is March 1, 1958. Both rail and water transportation facilities are accessible to the sulfur concession.



Shinto Rites for P&H Shovel

Impressive rituals performed before a traditional Shinto Shrine marked the completion of the first Japanese produced P & H Shovel at Kobe Steel Works, Ltd., Kobe, Japan. The services, conducted by two Shinto priests, are intended to ward off evil spirits by the presentation of food and wine to the shrine. This ceremony is performed only upon the completion of the first of a line of products. First machine to be completed was a P & H 255A crawler shovel with a ¾-yd capacity.

USI Builds Research Center

USI Technical Center, Inc., a subsidiary of U. S. Industries, will be located on 25 acres in Pompano Beach, Florida. The company plans to move into the first completed units by the third quarter of 1957.

Meanwhile, the technical center will occupy temporary headquarters in Boca Raton, Florida. It will do research and development work for USI's 12 divisions.

President of the new center is D. E. Gillum, who founded and until recently was president of Western Design and Manufacturing Corporation of Santa Barbara, California, a research and development firm specializing in the design and manufacture of electronic components and systems for aircraft and missiles. Western Design was acquired by U. S. Industries last August and is now a division of USI.

Consolidation Completed

Final consolidation of American Tractor Corporation into J. I. Case Company has been completed.

M. B. Rojtman

Marc B. Rojtman, former president of American Tractor, was elected to the newly created position of executive vice president and general manager of J. I. Case. Rojtman will have responsibility for the overall operation of the newly merged company. In addition, he has been elected to the board of directors and will serve on the executive committee. Two other members of the former American Tractor board, Hentor Kraus of Ft. Wayne, Indiana, and Edward Elliott, New York City, have also been elected to the Case board, which now comprises 15 members.

Plastic Pipe Company Formed

The United Pipe and Tube Company has opened a plant in Lubbock, Texas, to produce plastic pipe for use in oil fields, industrial plants, water systems, and gas distribution. Pipe manufactured will be primarily for oil and gas pipelines.

A new corporation, United Pipe and Tube management includes: President, Walter S. Pendergast, who was formerly vice president and general manager of an eastern plastics concern; Vice President Rom Rhome, in charge of sales and finance; Vice President W. F. Rippetone, who will be in charge of United's subsidiary, the High Plains Irrigation Supply Company.

The initial battery of equipment will include four pipe extrusion machines. Pipe sizes as large as 12 in. will be produced. Long-range plans call for the plastic coating of steel pipe and the production of steel line pipe.

Ability to offer plastic pipe in 6, 8, 10 and 12-in. sizes is the result of new developments in both extrusion and installation. Large-diameter plastic gas pipe offers the advantage of freedom from internal corrosion by sour gas and elimination of external coating and wrapping.

Caterpillar Plans Plant

Plans to build a half-million square foot industrial engine plant have been announced by Caterpillar Tractor Company. The firm also announced intention to construct a multi-building research center and a general offices building. All three facilities will be located 12 miles north of Peoria, Illinois.

Site preparation for the industrial engine plant is scheduled to begin within the next few months and construction dates for the research center and general offices building will be established after planning and necessary engineering work have been completed. Operations will begin during 1958 and 1959 in the new area.

The new plant will be the source of manufacture for Caterpillar V-type engines ranging up to 650 maximum horsepower in the current line. The source for all other engines will continue to be the Peoria plant. Basic engines intended for industrial use will be moved to the industrial engine plant where attachments, specially engineered to equip them for use as industrial and torque converter power units, marine engines or electric sets, will be added.

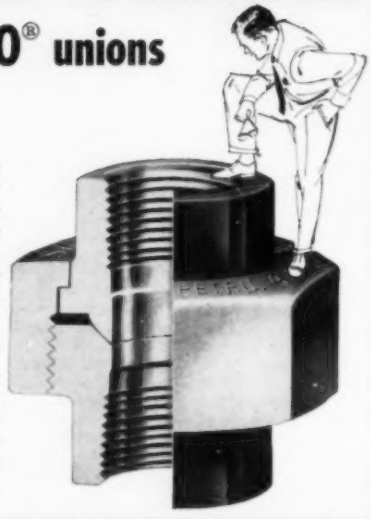
Calkin & Bayley—Consultants

Formation of a new firm of industrial consultants has been announced by George T. Bayley and John B. Calkin. The new organization, known as Calkin & Bayley, Inc., with offices located in New York City, will specialize in marketing and economic research, product and market development, process development and design, business and plant surveys, analysis and testing.

Officers of the corporation are John B. Calkin, president; George T. Bayley, executive vice president; Robert Frank, vice president in charge of marketing and economic research; John L. Parsons, vice president in charge of pulp and paper.

COMPARE

Clayton Mark PETRO® unions are your best buy



Next time you buy forged steel unions, remember to make this important comparison check! Be sure that you get the unions that have *all 16* of these quality points, to assure pressure-tightness, ease of installing, interchangeability, and re-useability. Be sure that you get Clayton Mark *Petro*®—made by the originators of steel unions!

Write—today—for your copy of "How to Tell a Good Union." It describes the importance of the 16 points . . . tells how they add up to better service and complete satisfaction. Order Clayton Mark unions from your distributor; 3000 and 6000-lb. screwed and socket weld types, ⅛" to 3" pipe sizes.

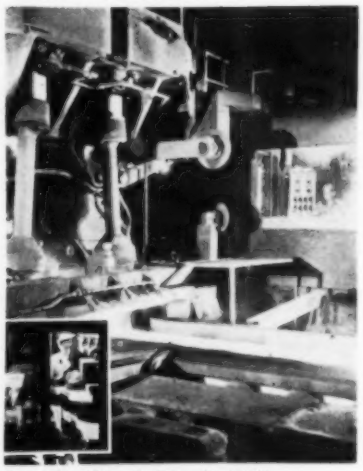
MAKE THIS COMPARISON CHECK BEFORE YOU BUY UNIONS

QUALITY POINT	PETRO	BRAND A	BRAND B	BRAND C	BRAND D	BRAND E	BRAND F
Made to AAR standard design	●		●	●		●	
Hardness differential between seats	●	●				●	
Cold-rolled female seat	●					●	
45° cone-to-ball seat	●	●	●	●		●	
Cadmium-plated nut	●		●			●	
Ends taper-reamed before threading	●		●		●	●	
Published steel specifications	●				●		
Each union individually tested	●						
Induction-heated for forging	●						
Hot-forged	●		●	●	●	●	●
Octagon wrench flats on ends	●		●	●	●	●	
Octagon wrench flats on nut	●	●	●	●	●	●	
Rounded nut and end wrench flats	●		●		●	●	
Turbulence-free fit across seats	●		●	●		●	●
Machined surfaces finished to "#40 turn" or finer	●	●			●		●
All sharp corners relieved	●	●					

CLAYTON MARK

CLAYTON MARK & COMPANY
1900 Dempster Street
Evanston, Illinois

Trade Parade



Punch Card Steel Mill

What is believed to be the world's first punch card-controlled steel mill, which has certain controls and speeds automatically set, is now turning out tons of steel daily at the Brackenridge Works of Allegheny Ludlum Steel Corporation, Pittsburgh, Pennsylvania. System uses punch cards on a 56-in. universal roughing mill — with certain areas cut out. These holes indicate the number of passes, the speed of rolling, and the sequence and amount of slab reduction. The control system was developed, manufactured, and installed by General Electric Company.

UOP Cracker Goes on Stream

South America's first fluid catalytic cracker designed by Universal Oil Products Company has gone on stream at the Companhia de Petroleo da Amazonia refinery at Manaus, Brazil. The 2000 bbl per standard day unit produces a 95 octane F1 plus 3 cc TEL product from a synthetic blended crude stock and reached guaranteed output within two days of startup. This unit is part of complete 5000 bbl per standard day refinery designed by Southwestern Engineering Company.

Alco Expands Facilities

Alco Products, Inc. has announced acquisition of a site in Houston, Texas, as the eventual production center for the company's petroleum industry equipment business. Company has established petroleum industry equipment division headquarters in Houston, as well as relocated its district sales offices.

Effective approximately February 1, new headquarters for the petroleum industry equipment division will be established on the fourth floor of the Bank of the Southwest in Houston. C. C. Davis is manager of the petroleum industry equipment division. E. N. Sieder is manager of marketing, E. F. Cooke Jr. is product development engineer, and C. H. Homer Jr. is plant manager.

Mann Heads Leschen

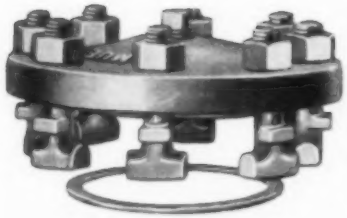
Emmett H. Mann has been named vice president and general manager, Leschen Wire Rope Division, H. K. Porter Company, Inc. At the same time, announcement was made of an expansion program at Leschen to be completed toward the end of this year. Cost will be almost $1,500,000. Wire drawing equipment will be installed in the expansion which will be the first time in its 100-year history that the company will perform the drawing phase in its wire rope production.

FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD

MUELLER

"NO-BLO® tee gives fast, safe tie-in"

Tie into steel lines under pressure—without interrupting flow or losing fluid — with the Mueller Flanged Tee. Forged-steel tee has similar analysis to pipe line, assuring easy weldability on inlet and outlet. 150, 300, 400 and 600-pound flanges withstand operating pressures up to 1200 p.s.i. Tee can be installed under operating pressures up to 500 p.s.i. at 100° Fahrenheit or 250 p.s.i. at 500° Fahrenheit with the Mueller power-operated C-1 Drilling Machine.



Cut into the line is made through the tee with Mueller equipment. Completion plug with "O" ring seal is inserted into tee through a gate valve to provide positive seal against leakage. Completion plug has internal equalizing valve which balances pressure on both sides of plug, assuring easy insertion into, or extraction from the tee while under pressure.

NO-BLO®

H-17505 Flanged Tee.
230 p.s.i. working pressure
at 100°F.
Sizes 3", 4", 6", 8".

Write for complete information. A complete line of Mueller NO-BLO® products is available for making stop-offs, running temporary lines and making tie-ins under pressure.

MUELLER CO. **DECATUR, ILL.**

Factories at Decatur, Chattanooga, Los Angeles.
In Canada: Mueller Limited, Sarnia, Ontario

Since 1857

W-S Forged Steel Fittings

Now protected with...

new blue rustproof coating

That attractive color you see on our forged carbon steel fittings is a new synthetic coating that effectively protects the fittings against corrosion in stock and in service. The coating completely covers the fittings—inside and outside, thus protecting threads and sockets, as well as external surfaces.

If you are going to paint your piping system for color coding or other reasons, the new coating serves as an excellent base for paint. No objectionable rust or scale to scour off before painting.

All W-S forged carbon steel fittings, in both screw-end and socket-welding types, are now available with the new blue rustproof coating.

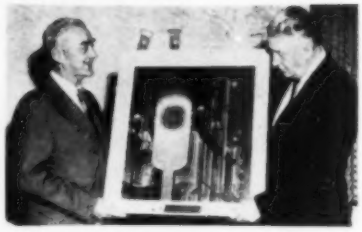
Remember the blue color. It labels the fitting a W-S Quality Product.

Send for your copy of Forged Steel Fittings Catalog A-3-56

Write to W-S Fittings Division, H. K. Porter Company, Inc., P.O. Box 95, Roselle, N. J.

HKP W-S FITTINGS DIVISION
H. K. PORTER COMPANY, INC.

Trade Parade



A painting of a platinum catalyst is being presented to Col. J. C. Raaen (left) of Universal Oil Products Company by B. B. Morton of International Nickel Company.

Universal Given Painting

An oil painting depicting the change that takes place when petroleum passes through a platinum catalyst has been presented to Universal Oil Products Company by The International Nickel Company.

It was presented to the company in recognition of its role in pioneering the use of platinum in a catalyst for reforming gasoline. In 1949 Universal introduced Platforming, a process employing the UOP platinum-containing catalyst and now widely used in reforming thermally cracked, straight-run and natural gasolines to raise their octane rating to levels required for modern high-compression motors.

Signing the agreement that makes available four $1600 4-H Forestry Scholarships each year for selected 4-H members are J. Allen Abbott (left), president, and Nelson Thompson, vice president-sales, of Homelite, a division of Textron, Inc.

NEWS NOTES

HOWE-BAKER CORPORATION IS opening an eastern division office in the New York area to provide engineering service for its electrical desalting and distillate treating processes.

THIRTY-FOUR DISTRIBUTION warehouses of The Bomud Company are now operating as retail stores of Baroid Division of National Lead Company. This change in name is the result of Baroid's acquiring the physical assets of The Bomud Company a year ago.

PLANS FOR THE CONSTRUCTION of a new million-dollar plant in eastern Nassau County, New York, for Servomechanisms, Inc. have been announced. The 55,000-sq ft plant will house engineering and production operations of the subsystems group of the company.

THE WIRE AND CABLE BUSINESS of United States Rubber Company has been sold to Kaiser Aluminum & Chemical Corporation. The sale became effective February 1. It will include the plant, property, and equipment in Bristol, Rhode Island. In addition, Kaiser Aluminum will take over U. S. Rubber's wire and cable inventories, sales organization, and distribution network.

PAYNE MANUFACTURING COMPANY of Houston, Texas, has incorporated under the firm name of Payne Manufacturing Company, Inc. V. H. Payne, who formed the company in 1946, will be president; W. E. Webster, 10 years sales manager, vice president; R. A. Bridges, secretary-treasurer.

ATLAS POWDER COMPANY'S TECHNICAL center, for which ground was broken on January 17, is located next to the company's general offices in Wilmington, Delaware. It will house the Atlas chemical research and product development departments.

A FUND OF MORE THAN $1,000,000 for grants to 122 universities and colleges in its annual program of aid to education is announced by E. I. du Pont de Nemours and Company (Inc.). This support, which is for the next academic year, is a substantial increase over the $900,000 in gifts made for this year.

ROBERTSHAW-FULTON CONTROLS Company has announced the acquisition of The Beta Corporation, Richmond, Virginia, manufacturers of specialized vibration monitoring equipment.

FIRST SHIPMENT OF BARITE FROM the new Greek mining and ship-loading facilities of Magnet Cove Barium Corporation has arrived at Magcobar's New Orleans, Louisiana, plant. This initial 10,000 tons of barite wil be processed for use as heavy-weight material for drilling mud.

ATLAS POWDER COMPANY HAS broken ground for a $3,000,000 technical center, which will enable the company to intensify its long-range basic research program, as well as to expand its technical service to the petroleum industry. New center will be located adjacent to the company's general offices at Wilmington, Delaware, and is scheduled for completion by the end of this year.

PEOPLE

Dr. U. T. Greene has been promoted to the newly created position of assistant director of commercial development for Diamond Alkali Company.

L. C. Daniels is now general manager of the Buda Division, tractor group, Allis-Chalmers Manufacturing Company, and **Owen J. Higgins** is general manager of the Harvey, Illinois, works.

L. C. Daniels

C. E. Russell

C. E. Russell has been elevated from works manager to vice president in charge of manufacturing at The J. M. Beaird Company, Inc.

James L. Sheehy has been appointed district manager of the western area recently established in San Francisco, California, by Tube Turns Plastics, Inc.

J. L. Sheehy

A. A. Dunaway

Alton A. Dunaway has been appointed assistant vice president of distribution operations of Continental-Emsco Company.

Robert G. Dee has been appointed general sales manager of the ElectroData Division of Burroughs Corporation. He will supervise sales in the U. S. and Canada of Datatron digital computing systems, tabulating and card-punching equipment.

James O. Gravitt, manufacturer's agent of Mt. Vernon, Illinois, has been appointed sales representative of Win-Well Manufacturing Company. His terirtory will cover Illinois, Indiana, Kentucky, Ohio, and Michigan for Win-Well.

R. H. (Bob) Fisackerly has been promoted to the position of general sales manager for Mississippi Chemical Corporation, Yazoo City, Mississippi.

Boyd S. Oberlink, group vice president of Allis-Chalmers Manufacturing Company, has been elected to the board of directors.

WHEELING
COUPLINGS
FOR OIL COUNTRY USE
LINE PIPE COUPLINGS A.P.I.
1/8" to 12" — Seamless — Black or Galvanized
PLAIN TUBING COUPLINGS A.P.I.
1" to 4" — Seamless
EXTERNAL UPSET TUBING COUPLINGS A.P.I.
3/4" to 3 1/2" — Seamless
CASING COUPLINGS A.P.I.
4 1/4" to 13 3/8" — Seamless — Long or Short
HYDRAULIC COUPLINGS
1/8" to 4" — Seamless
REAMED AND DRIFTED A.I.S.I.
3/4" to 12" — Seamless
DRIVE PIPE COUPLINGS
6" to 12" — Seamless
TOP QUALITY Since 1918
Sales Offices in Leading Cities:
Albany, N. Y.—Albert L. Becker, 434 Clinton Ave.
Baltimore, Md.—William H. Thurlow, 2301 No. Charles St.
Chicago, Ill.—Harry A. Jay, Suite 1090, Old Colony Bldg.
Denver, Colo.—Earl H. Jones & Co., 1863 Wazee St.
Detroit, Mich.—R. W. Lang, Jr., 505 Park Avenue
Erie, Pa.—R. J. Maggi, Box 711
Falmouth, Mass.—Walter S. Bennett, 53 Minot St.
Grand Rapids, Mich.—R. W. Lang, Jr., 138 Burton SE
Houston, Texas—Henry H. Paris Distributor, Inc., Box 932
Independence, Mo.—Craig A. Fross, 3701 Norwood
Los Angeles, Cal.—James A. Riordan Co., 1400 Santa Fe Avenue
Louisville, Ky.—Sid. Schultze Co., 514 W. Main St.
Milwaukee, Wis.—W. G. Nelson, 3347 N. 97th St.
Narberth, Pa.—J. W. Worthington, 105 Forrest Ave.
Newark, N. J.—Ira L. Rothenberg & Assocs., 398 Market St.
New York, N. Y.—Max Rothenberg, 11-05 38th Ave., Long Island City
Omaha, Neb.—Wm. Freiden, Central States Engineering & Sales Co., 5101 Blondo St.
Oswego, N. Y.—Northeastern Associates, Inc., Neil Chatterton, Secretary, P. O. Box 284
Portland, Ore.—Earl H. Jones & Co., 1233 NW 12th Ave.
Richmond, Va.—P. C. Abbott & Co., 15 E. Franklin St.
St. Louis, Mo.—Walter C. Dollinger, Dollinger & Lucas, 1047 Big Bend
Seattle, Wash.—Earl H. Jones & Co., 819 Thomas St.
WHEELING MACHINE PRODUCTS COMPANY
WHEELING, WEST VIRGINIA
Factories at WHEELING, W. VA. and WOODLAKE, CALIFORNIA

FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD

Trade Parade

Thomas F. Long has been named vice president in charge of sales at Alpha Plastics, Inc., Livingston, New Jersey, manufacturers of rigid, unplasticized polyvinyl chloride pipe and tubing.

T.F. Long

G. C. Stineback

George C. Stineback, general sales manager of Polyken Industrial Tapes, has been advanced to director of sales of the Chicago division of The Kendall Company.

An extensive reorganization of the field sales structure of the Manhattan Rubber and Packing Division has been made by Raybestos-Manhattan, Inc. New regional managers and their respective district managers are: **R.F. Teeling,** eastern regional manager; **Stewart Monroe,** New York district manager; **J. T. M. Frey,** New Jersey district manager; **F. McBrearity,** Philadelphia, Pennsylvania, district manager; **A. L. Hawk,** central regional manager; **A. N. Johnston, Jr.,** Pittsburgh, Pennsylvania, district manager; **G. S. Himebaugh,** Chicago, Illinois, district manager; and **E. T. Fair,** Denver, Colorado, district manager; **C. P. Shook, Jr.,** southern regional manager; **A. A. Ringland,** Birmingham, Alabama, district manager; **A. E. Jackson,** New Orleans, Louisiana, district manager; **E. W. Nagel,** Dallas, Texas, district manager; **R. C. Neilson,** Houston, Texas, district manager; **S. V. V. Hoffman,** western regional manager, and **R. B. Park,** San Francisco, district manager.

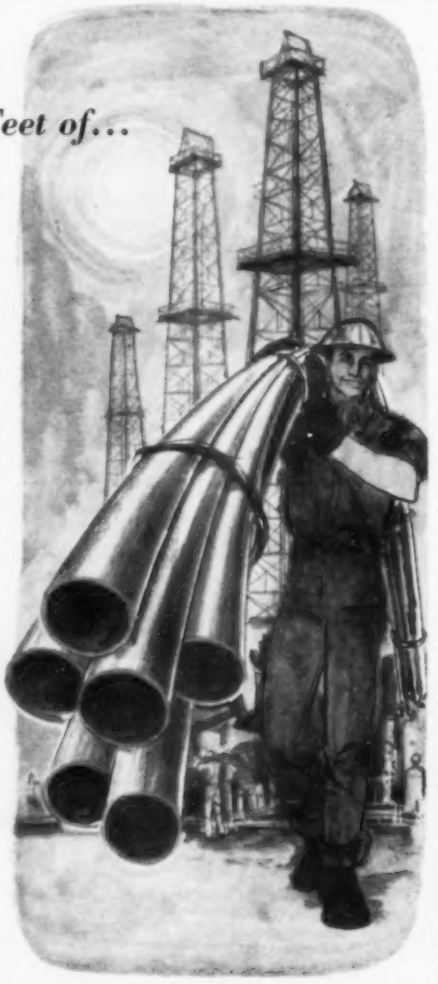
Over One Million Feet of...

KRALOY

HIGH-IMPACT

PVC PIPE

in oil-country use today



This proves that there is no substitute for Kraloy experience.

KRALOY is the most experienced manufacturer of PVC plastic pipe for the petroleum industry. The first polyvinyl chloride lead line installed in this country—at Great Bend, Kansas—was Kraloy Pipe. Kraloy High-Impact PVC today is preferred by production men for maintenance-free service in lead lines and disposal systems. Kraloy customers use Kraloy High-Impact PVC pipe for lead lines, gas lines, and salt water lines because Kraloy normally eliminates (1) sulphur corrosion due to sour crude, (2) paraffin buildup, (3) corrosion and scale, (4) trouble from soil electrolysis.

YOU Benefit From KRALOY'S Quality Control

To insure quality control, random samples of Kraloy Plastic Pipe are tested daily in Kraloy's own laboratory for burst pressure, impact resistance, and tensile strength under standard ASTM specifications.

Kraloy Pipe is Sold Only Through Qualified Supply Stores

Warehouse stocks and sales representatives:

Great Bend, Kansas:
Robinson Oilfield Specialties Co.,
616 Main St.

Houston, Texas:
The Mott Company,
1719 McKenney St.

Tulsa, Oklahoma:
The Becker Sales Company,
2837 Sands Spring Rd.

For case histories of actual Kraloy installations, cost comparison tables between Kraloy and other pipe, plus detailed instructions and specifications for all field uses, write to:

KRALOY *plastic pipe co., inc.*

4720 East Washington Boulevard, Los Angeles, Calif.

Subsidiary of the Seamless Rubber Co., a **Rexall Drug Co.** Subsidiary

SP-102

E. Van Dornick has been appointed vice president and corporation director in charge of Macco Corporation's refinery and chemical division.

E. Van Dornick

John Veckly

John Veckly is now director of the advertising division of United States Steel Corporation. **G. R. Schreiner** has been appointed special assistant in the office of the executive vice president, commercial.

H. E. Bramston-Cook has been elected to the board of directors of Oronite Chemical Company, chemical subsidiary of Standard Oil Company of California. Other Oronite personnel shifts included: **N. E. Hathaway,** to the new position of general sales manager; **J. R. Stitt,** named coordinator of marketing, and **T. M. Welton,** appointed eastern regional sales manager.

Kenneth E. Jones has joined the organization of Joe Stine, Inc., as chief engineer. In his new capacity, Jones is specializing in design, as well as manufacturing supervision of offshore equipment.

K. E. Jones

R. D. Boutros

Richard D. Boutros has been advanced from chief engineer to vice president and director of engineering at Mixing Equipment Company, Inc. **Milton Dykman** has been promoted to chief engineer, and **Howard C. Shufelt** becomes assistant to the chief engineer.

Roy O. Schiebel has been elected to the newly created position of second vice president, sales and marketing, of Magnaflux Corporation.

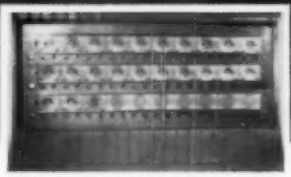
R. O. Schiebel

D. H. Nelson

Dewey H. Nelson, formerly assistant to the sales manager, has been promoted to sales manager of Becco Chemical Division, Food Machinery and Chemical Corporation. He succeeds the late John F. Shea, who was vice president in charge of sales at the time of his death.

Gavin A. Taylor is now assistant sales manager of the butyl division of Enjay Company, Inc.

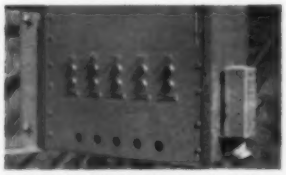
COC® at work



Fault alarm indicator at Ventura Field control station.

Hammarlund COC units at control station. System may be expanded at any time without obsolescence.

COC unit in weatherproof cubicle at "trap farm." Modular design of all COC units permits field maintenance by non-electronic personnel.



Detailed trouble-shooting panel at "trap farm" pinpoints malfunction.

Typical Ventura Field "trap farm." COC cubicle in foreground. "Trap farms" are located ¼ to ½ mile apart and are all connected to the control point by a single telephone line.

FOR SHELL OIL COMPANY IN VENTURA FIELD, CALIFORNIA

22 "trap farms" monitored for fault alarm from a central control station over a single telephone line — that's what Hammarlund Centralized Operations Control equipment is doing for Shell Oil Company in their Ventura Field installation.

Malfunction of gas-oil separators, or high tank level warnings at any of the 22 "trap farms" is immediately indicated at the Ventura Field control station. At the indicated "trap farm," a detailed fault alarm system pinpoints the malfunction for the maintenance crew.

This is another example of how Hammarlund COC equipment works in the petroleum industry. The ever-growing number of such installations is proof of the dependability, simplicity and economy of COC equipment.

HAMMARLUND
MANUFACTURING COMPANY, INC.
460 West 34th Street, New York 1, N. Y.
Established 1910

In Canada: The Ahearn & Soper Co. Limited; P.O. Box 715; Ottawa, Canada
Export: Rocke Intl. Corp.; 13 East 40th St.; New York 16, N. Y.

We can prove...

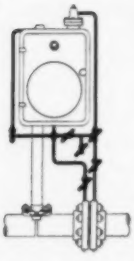
that COC can save you money and headaches.

Tell us when and where you want a demonstration.

Or, write for complete literature . . .

For corrosive field service...

AMERICAN® Needle Valves



Teflon-packed, forged steel American® Needle Valves stand up in the toughest meter manifold jobs and other corrosive field services without gland leaks. Stainless or carbon steel precision machined valve bodies are specially suited for welding. Stainless steel centerless-ground valve stems are designed so that the valve can be repacked under pressure.

Standard valves design rated for pressures to 5,000 psi at 70°F. For pressures to 10,000 psi, upon request, valves are hydrostatically tested and individually inspected. Valves are furnished with graphite-impregnated asbestos packing for temperatures above 450°F.

Angle or straight patterns —screwed or union bonnets.

Consult your American Meter representative for full details.

AMERICAN® METER COMPANY

INCORPORATED ESTABLISHED 1887

GENERAL SALES OFFICE: Somerton, Philadelphia 16, Penna. • Albany Alhambra • Atlanta • Baltimore • Birmingham • Boston • Chicago Dallas • Denver • Erie • Houston • Kansas City • Los Angeles • Minneapolis • New York • Omaha • Pittsburgh • San Francisco • Seattle Tulsa • Wynnewood. IN CANADA: Canadian Meter Company, Ltd., Milton, Ontario • Calgary • Edmonton • Regina

SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters • American-Westcott Orifice Meters Instruments • Reliance Regulators • Apparatus • Valves

Trade Parade

Robert T. Bailiff has been appointed sales promotion manager of L. O. F. Glass Fibers Company.

J. D. Harris

J. F. Gardner

James D. Harris has been elected vice president and general counsel of The Fluor Corporation, Ltd. **John F. Gardner** has been elected vice president in charge of employee, public relations and advertising.

H. T. Hamm has been appointed comptroller of Houston Oil Field Material Company.

Fred C. Foy, president, Koppers Company, Inc., has been elected to the board of directors of H. K. Porter Company, Inc. Mission Manufacturing Company has promoted two men to district managers: **John H. Brown,** Mid-Continent district, headquartered at Marlow, Oklahoma, and **John H. Bannister,** West Texas district, headquartered in Midland. **Henry A. Lee** has been named regional sales engineer at Midland.

Walter Bryant has joined Perrault Equipment Company, Tulsa, Oklahoma, pipeline equipment manufacturer and distributor, as Southwest district field representative. **Kenneth (Ken) Fowler** has been appointed Northwest field representative.

Gilbert Asher, veteran Oklahoma newspaper man, has been appointed director of an accelerated public relations and advertising program for the Refining Engineering Company (Treco).

Donald E. Stewart has become a field and research engineer for the petroleum division of Schramm, Inc., Tulsa, Oklahoma.

H. H. Farnham

E. J. Hagstette, Jr.

Baroid Division, National Lead Company, has made several organizational changes. **Harold H. Farnham** was appointed assistant to the general manager, project development and **E. J. Hagstette, Jr.,** assistant to the general manager. **B. L. Boccella,** area manager at Tulsa, Oklahoma, will be directly in charge of all operations in the Mid-Continent area, including the Texas Panhandle, which was formerly a part of the West Texas area.

Judson D. Lowd has assumed new duties as export manager for National Tank Company.

J. D. Lowd

C. C. Crider

C. C. Crider has been appointed general manager of stores for the Bethlehem Supply Company. Succeeding Crider as central division sales manager will be **Arthur Weber Jr.**

New sales and service engineers in the Houston area for Weatherford Oil Tool Company are **Bernie W. Lawson** and **Henry J. (Bud) James. Martin W. Smith** has been named airplane pilot for the company.

GIVE YOURSELF A BREAK!

with BrakeSol

HOLDS PARAFFIN IN SUSPENSION from FORMATION to REFINERY

Now is the time to give yourself a break with BrakeSol and clean the paraffin from your production system. Then keep it clean by setting up a program of constant treating.

FORMATION. Get more production by cleaning up the formation with BrakeSol. Use with frac jobs to get more effective results.

HEATER-TREATER. BrakeSol will allow the use of less heat, thereby increasing the gravity of your oil.

TANKS. Clean up that tank bottom by treating it back into the oil where it can be sold. Equally effective on the largest pipeline tank and the smallest stock tank.

CARMI, ILLINOIS 4-2905
CASPER, WYOMING 2-3453
GREAT BEND, KANSAS 4285
FT. MORGAN, COLO. UNderhill 7-6389
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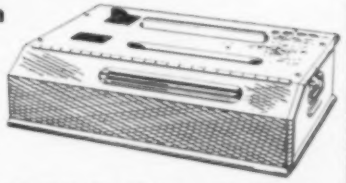

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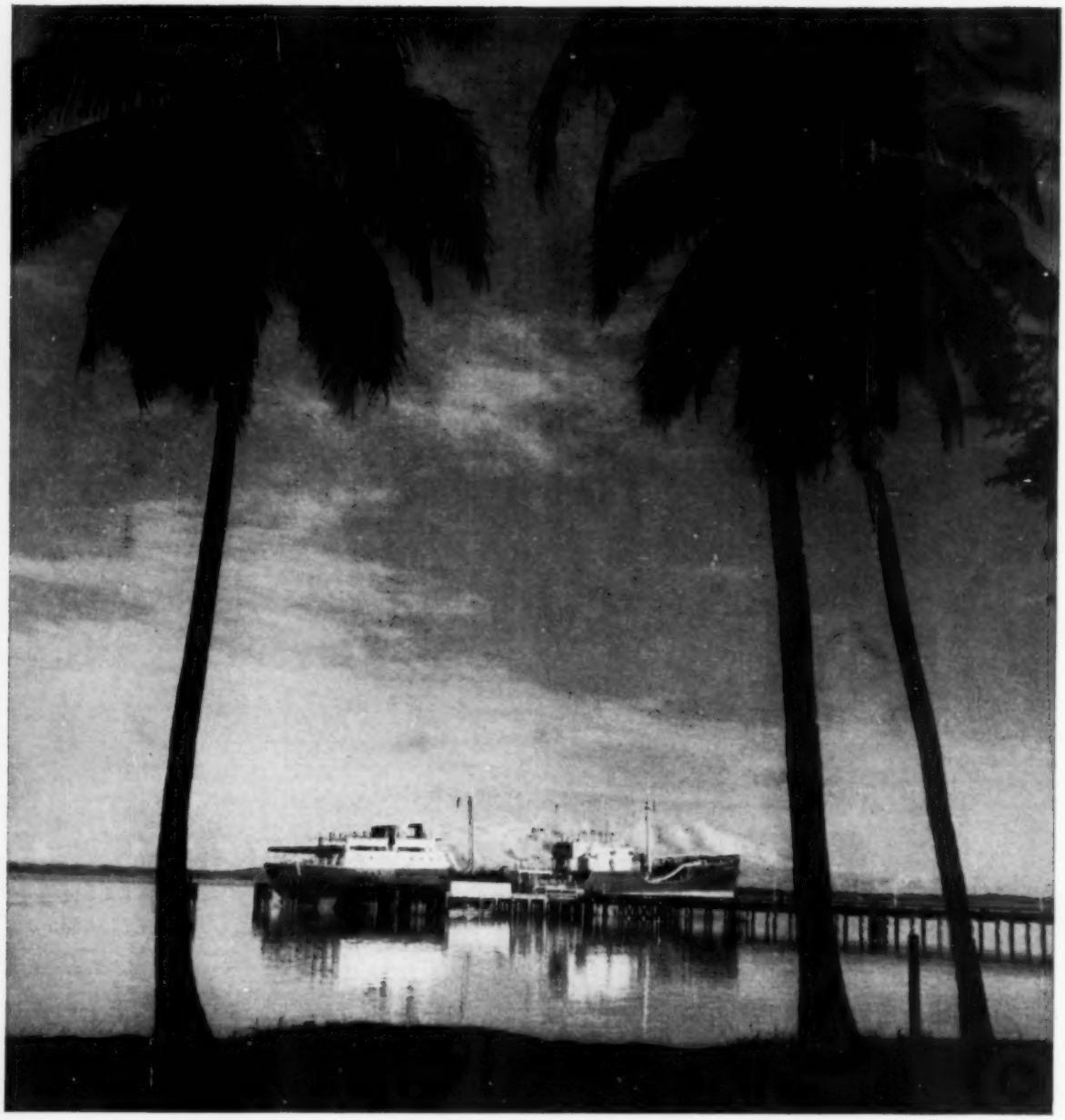

"Change is a law of life. But what is disturbing is evidence now and then of a drift backward to the old notion that agreements are merely scraps of paper. The world cannot be organized for its own good on any such foundation of irresponsibility. We must be able to rely upon each other's word. There is no other principle on which people and nations can work together for progress and their mutual benefits."

— *Eugene Holman, Chairman of the Board, Standard Oil Company (New Jersey)*

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Progress in the West means...

plentiful raw materials for 3000 manufacturing firms by 1965

Standard's economists say: "New products from Isophthalic will help provide employment for the 600,000 new workers in manufacturing the West will have by 1965."

*Manufactured and distributed by Standard's wholly owned subsidiary, Oronite Chemical Company.

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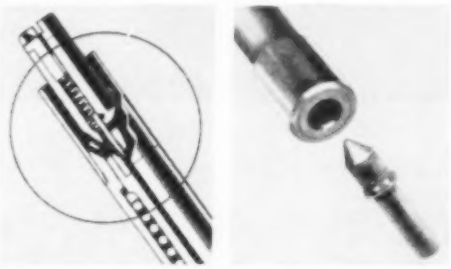
plans ahead to serve you better

REPORTS OF PERFORMANCE

from users during the past 16 years show that Kennametal* lasts 20 times longer than steel and 3 to 5 times longer than special and super alloys.

- A Texas producer reported sand abrasion forced a pulling job every 14 to 20 days. After 448 days on the job, Kennametal Balls and Seats showed no wear when well was pulled for other than valve job.



Kennametal wear parts in this Otis bottom hole regulator provide 12,000,000 closures under 1200 psi in sand-sulfide fluid. Used parts illustrated have already given 3,628,000 closures in six months service, from 7000 feet.

Kennametal API Balls and Seats are available at repair shops of most major pump manufacturers. Ask your service man to standardize on them. They'll cost you less in the long run. KENNAMETAL INC., Dept. PE, Latrobe, Pa.

*Kennametal is the Trademark of a series of hard carbide alloys of tungsten, tungsten-titanium and tantalum.

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Reduces Your Lifting Costs by Preventing Sub-surface Corrosion

Corexit treatments protect sucker rods and tubing against corrosion and hydrogen embrittlement, even in sour crude wells. Batched down the annulus, *Corexit* works rapidly to clean up your sub-surface equipment, to displace corrosive brine and loose scale from the metal surfaces. Then it builds up a tenacious and durable protective film on these cleaned metal surfaces to prevent further corrosion. Following the initial treatment, the use of a small amount of *Corexit* daily will maintain this tough protective film.

Consequently, you will find lifting costs lower, because *Corexit* prolongs the life of your equipment, and reduces the number of well pulling jobs.

For complete information on *Corexit,* call your nearest Humble wholesale plant in Texas and New Mexico, or write or phone:

HUMBLE OIL & REFINING COMPANY

HUMBLE

Technical Service
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Humble Oil & Refining Company
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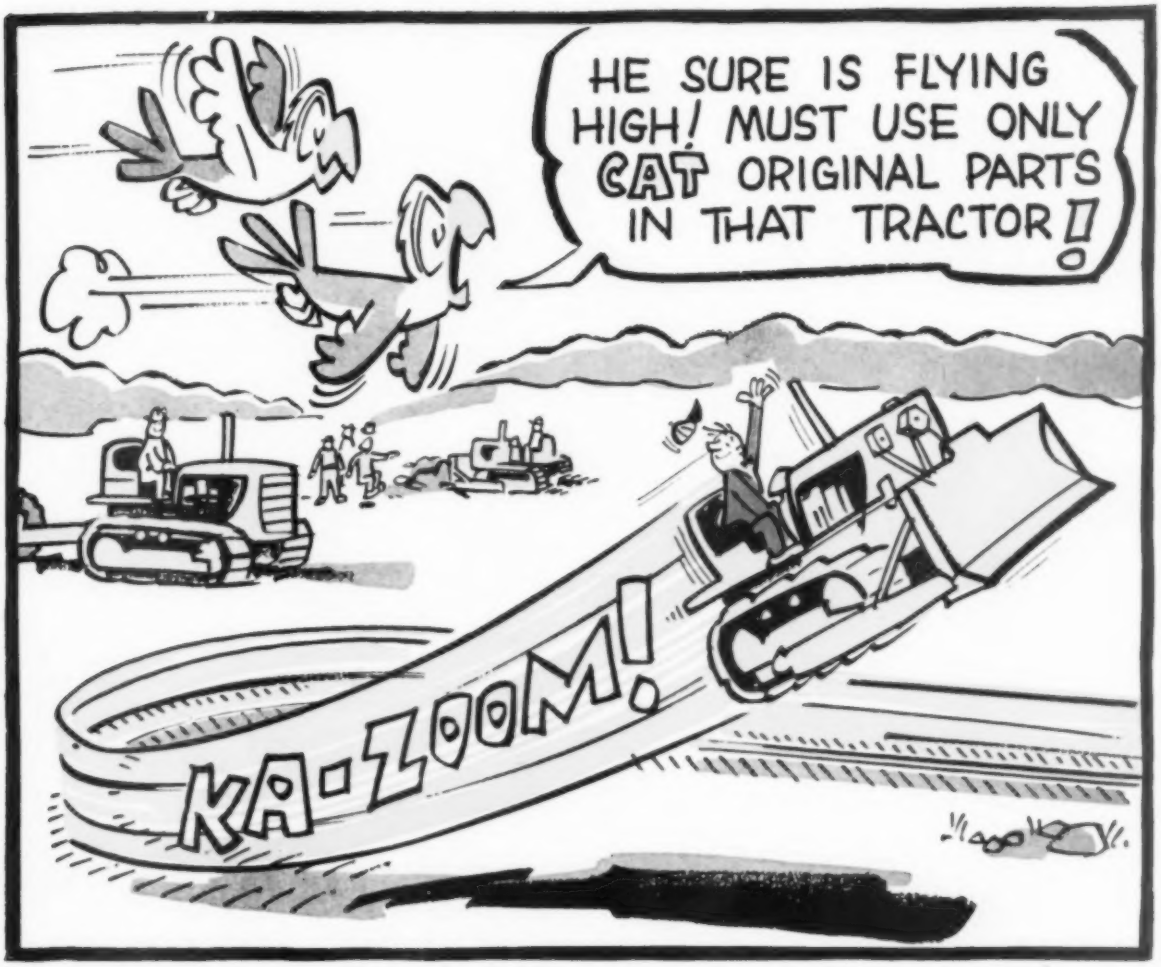
FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD



Are you aware of the BIG THREE in CAT* bellows seals for idlers, track rollers and final drive? You get special, long-lasting FACING MATERIAL . . . with just the right amount of CONTACT PRESSURE at the mating surfaces . . . and AUTOMATIC ALIGNMENT to keep facings flush and to compensate for wear. Each BIG THREE feature was *developed* and *proved best* for Cat-built Tractors. If it's a "look-alike" seal, who knows? Be sure to get parts you can trust—from your Caterpillar Dealer. He always has *exactly* the part you need.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

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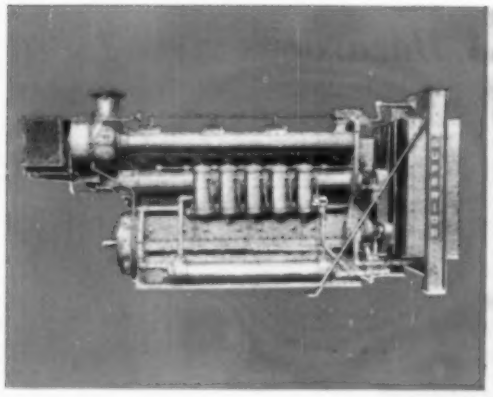


powered by White's Superior Diesels . . .

SHORELINE'S RIG 7 DRILLS TO SUPER-DEPTHS

Tremendous depths, restricted only by present drill pipe and drilling methods, are reached by Shoreline Drilling Company's new Marine Rig 7, located in the West Delta Area off the Louisiana Coast. For prime power on this isolated Gulf platform, where drilling is being done for the CATC Group, Shoreline wisely chose three White PTDS-8 Supercharged Superior Diesels, each rated at 800 B.H.P.

Greater operating economy and dependability with White Diesels assure more profitable and continuous development drilling. Moreover, the up to 30% power increase in the newly improved Super PTD's gives greater working ability, more lugging power and faster acceleration. Yet engine size is not increased, resulting in less weight and less cost per horsepower.

Many other new design and engineering features make White Diesels outstanding for rugged, efficient, low-maintenance service. Superior Diesel, Dual Fuel or Gas oil field engines are available from 320 to 2150 B.H.P. Get the facts from leading rig manufacturers, White Diesel representatives in oil field areas, or the White Diesel Engine Division general office.

White Diesel

WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY

Plant and General Offices: Springfield, Ohio

Selecting A Motor Drive For A Hazardous Area?

Here's how

TEIGF motors

by E-M

provide safe, dependable, economical power

Faced with the problem of driving hydrogen compressors in atmospheres which might contain hydrocarbons at their Baltimore refinery, engineers of Esso Standard Oil Company turned to TEIGF (Totally Enclosed Inert Gas Filled) Motors. Horsepower requirements exceeded the practicable limits under which explosion-proof motors could be used.

An important consideration was getting the greatest possible drive economy while operating safely in a possible hydrogen atmosphere. Three E-M 350 hp, 390 rpm TEIGF Motors are on duty at Esso Standard Oil Company fulfilling these important qualifications.

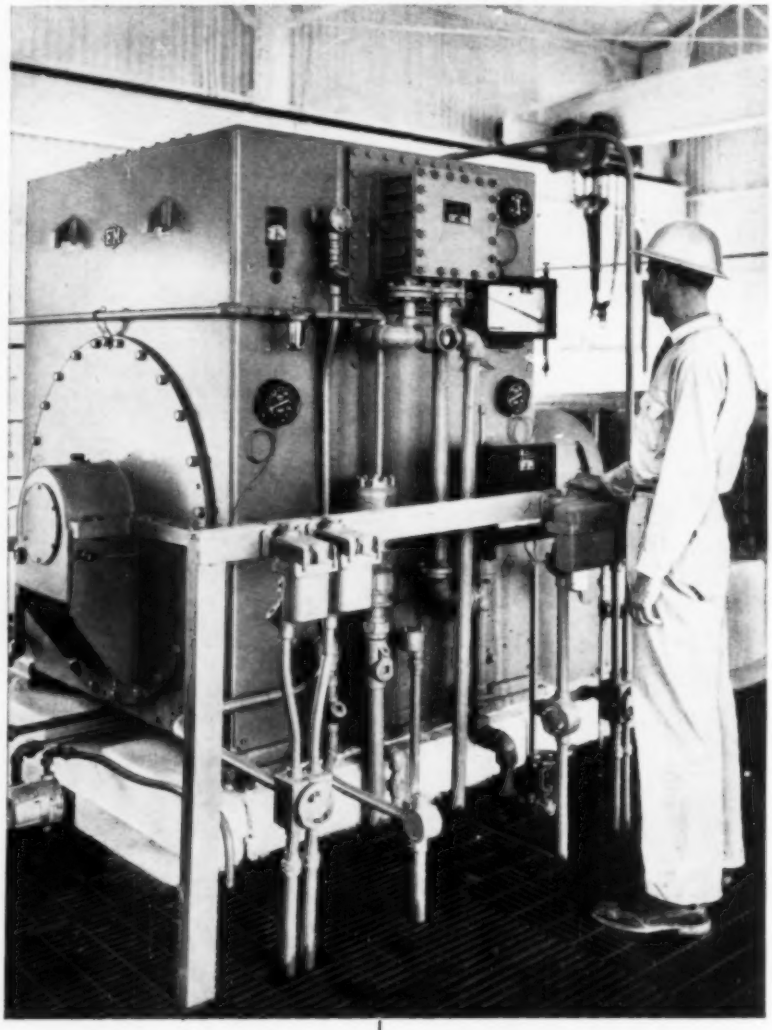
For Esso Standard Oil Company and other companies with similar problems, these E-M Motors offer three main groups of advantages:

1. SAFETY — Within the motor enclosure, inert gas pressure above atmospheric keeps explosive hydrogen *out*. A series of features help accomplish complete safety . . . inert gas pressure gauges . . . temperature gauges . . . purging valves, etc. and a full line of optional equipment. The E-M TEIGF Motor can be "customized" to meet your needs exactly.

2. RUGGED DEPENDABILITY. E-M uses specially designed "box type" frames of heavy-duty plate steel reinforced with heavy bar-stock ribs. They cannot twist or distort. Air gap is accurate and permanent, as all frame welding is completed before precision boring. Ventilating gas passages are carefully engineered to provide unimpeded gas flow for optimum cooling.

3. ECONOMICAL OPERATION. In E-M TEIGF Motors, gas loss is lower than commercially accepted standards. Specially designed shaft seals are oil-pressure gas-sealed bearing type, virtually non-wearing. Where bolts enter outside casing, E-M engineers specify blind holes . . . tapping and drilling are done *into* casing, not through. Operating and maintenance costs are at a minimum.

Consult your nearest E-M sales engineer, or write the factory for TEIGF Motor Bulletin No. 226.



TYPICAL STANDARD FEATURES INCLUDE:

1. Top-mounted gas-to-water cooler for use with suitable cooling water supply.
2. Forced-feed lubricated bearings and oil-pressure gas seals.
3. Oil pump, motor and oil filter. (Can be supplied optionally inside enclosure.)
4. Inert-gas temperature gauge.
5. Inert-gas pressure gauge.

(additional features shown in Bulletin No. 226)

TYPICAL OPTIONAL FEATURES INCLUDE:

1. Water cooler with double-tube construction for added protection against leakage.
2. Liquid level detector switch. Accumulation of moisture within motor sounds alarm or shuts down motor.
3. Bearing temperature relays, to sound alarm or shut down motor.
4. Explosion-proof motor terminal pothead or inert-gas filled terminal box.
5. Water flow indicator. Can be adapted for use with pneumatic-type regulating device.

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Specialists in making motors do

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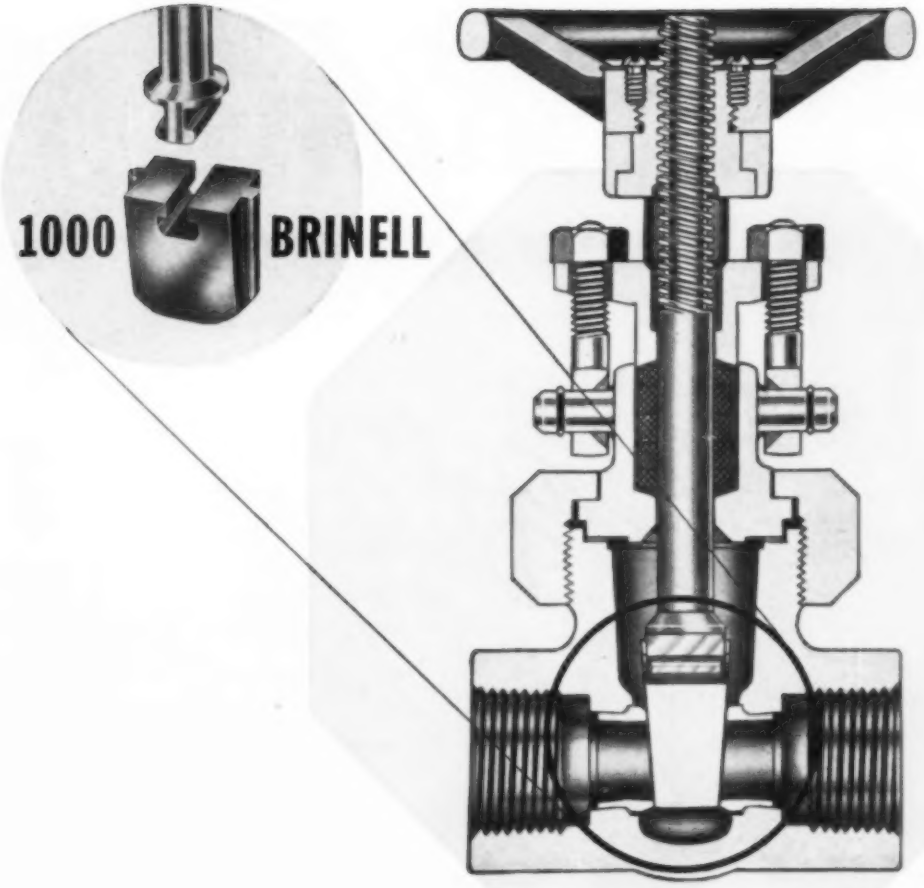


Fig. 1221

Stop Galling with the hardest valve wedges you can buy

OIC VALVES | FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON VALVES

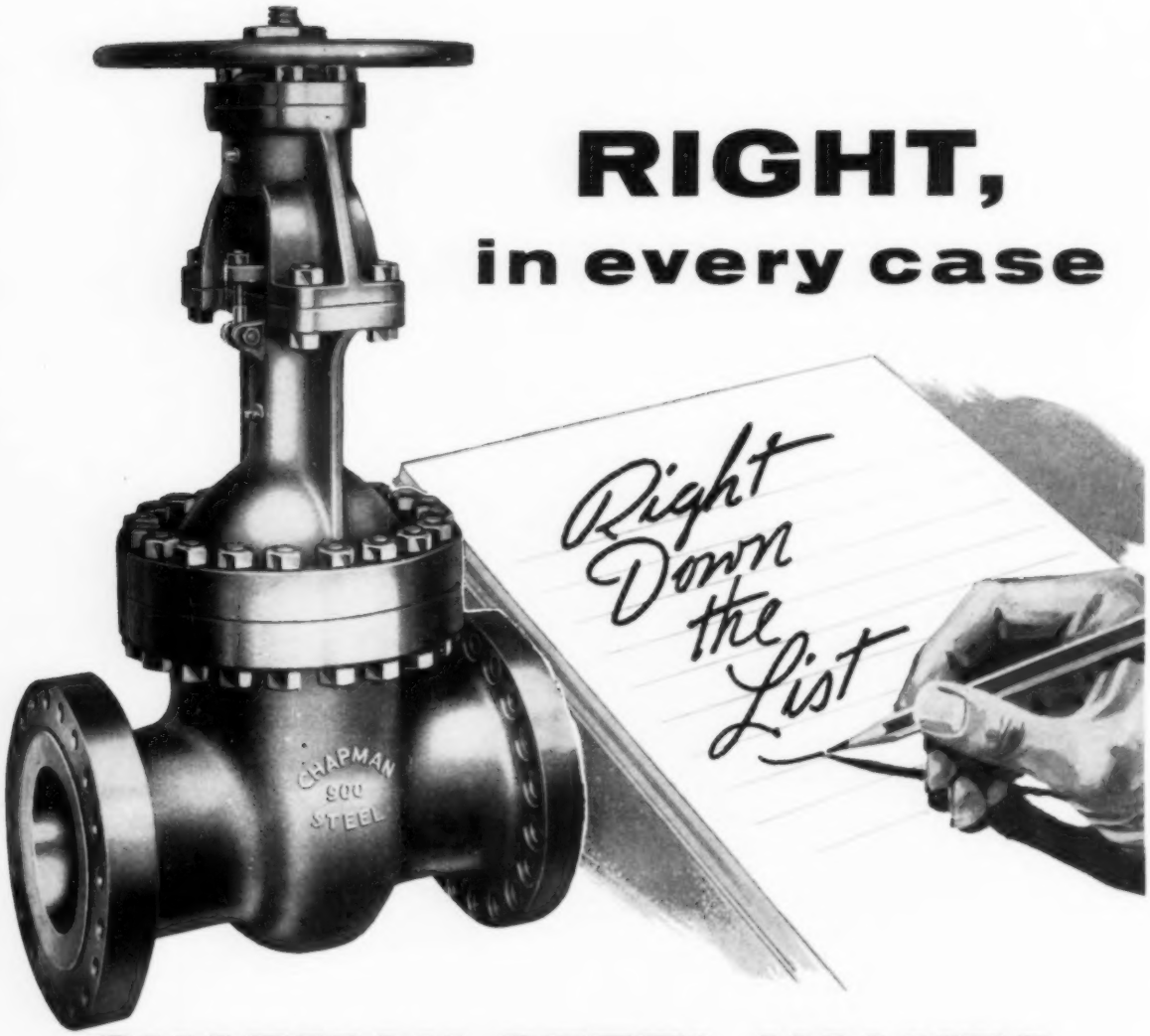
Highly resistant to erosion and corrosion

Here's a wedge as hard as flint . . . so hard that it's undamaged by pipe cuttings, scale or grit. It's the only trim we know of which will successfully withstand the simultaneous attack of the three valve-destroying agents—corrosion, erosion, galling. This wedge is *13% chrome stainless steel hardened up to 1000 Brinell.*

Specify the OIC 1221 gate or 1621 globe where you need the extra rugged nature of forged steel. They are recommended for steam service up to 800°F...oil service up to 1000°F. Or, use these same valves for hydraulic service up to 2000 lbs.

Write for Form 195 for specifications on the OIC forged steel line.

THE OHIO INJECTOR COMPANY
WADSWORTH, OHIO



RIGHT, in every case

CHAPMAN STEEL VALVES

Check them off, one by one. They're all important to you, a user of valves . . . steel valves. You want close tolerances; tight and positive seats; smooth, dependable, operation without jamming, chattering or excessive wear. Even with long service under the most severe conditions you want to cut your maintenance costs to a new rock bottom low.

Name your metal. You can have Chapman Steel Valves in standard alloys for normal requirements . . . or special alloys for extra service conditions. And for *your* benefit, all of these alloys are poured in Chapman's own foundries under rigid technical supervision.

Chapman superior steel valves — gates, globes, checks — are available for all pressure and temperature ranges. You can order them with bolted, welded or pressure seal body and bonnet joints and with flanged or welding ends. They all equal or exceed ASA and API standards in every range.

Why not write now for our complete descriptive catalog No. 20.

THE CHAPMAN VALVE MANUFACTURING CO.
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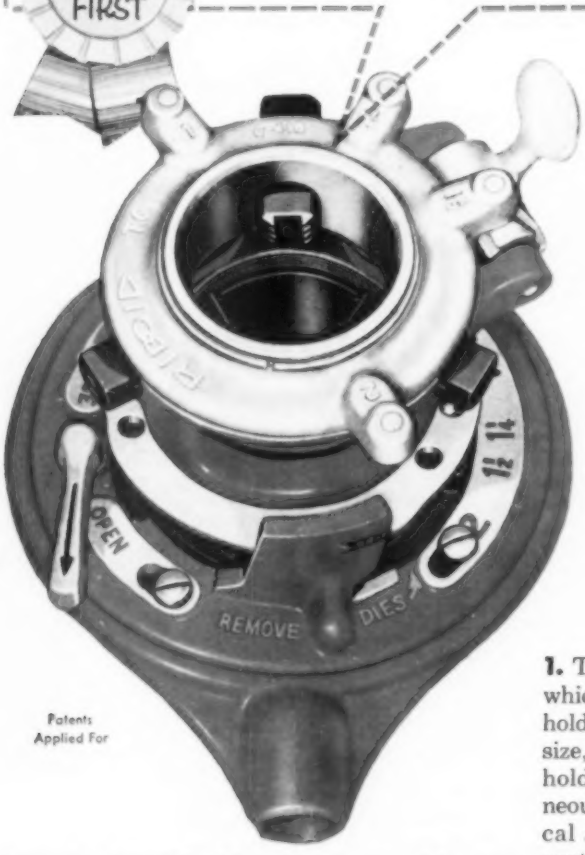
Big News!

RIDGID 65R

Now Has A Revolutionary New

Another RIDGID FIRST

True-Centering Workholder



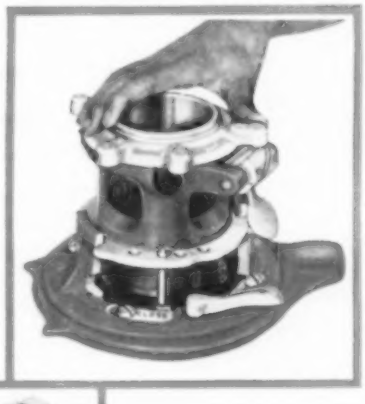
Patents Applied For

That Guarantees Always True Straight Threads

...even on over or under size pipe

Because All 3 Workholder Jaws Close At One Time!

Here's How It Works . . .



1. Turn cam plate which pre-sets workholder to desired pipe size, closes *all* 3 workholder jaws simultaneously by 1 mechanical action, for exact centering of die stock on pipe, even if pipe is over or under size.

2. When threader is on pipe, all 3 workholder jaws tighten in 1 action by bump of forged cam lever with palm of hand. Jaws grip and hold tight. Threads are *always* straight and true.

New TC Workholder fits your old 65R

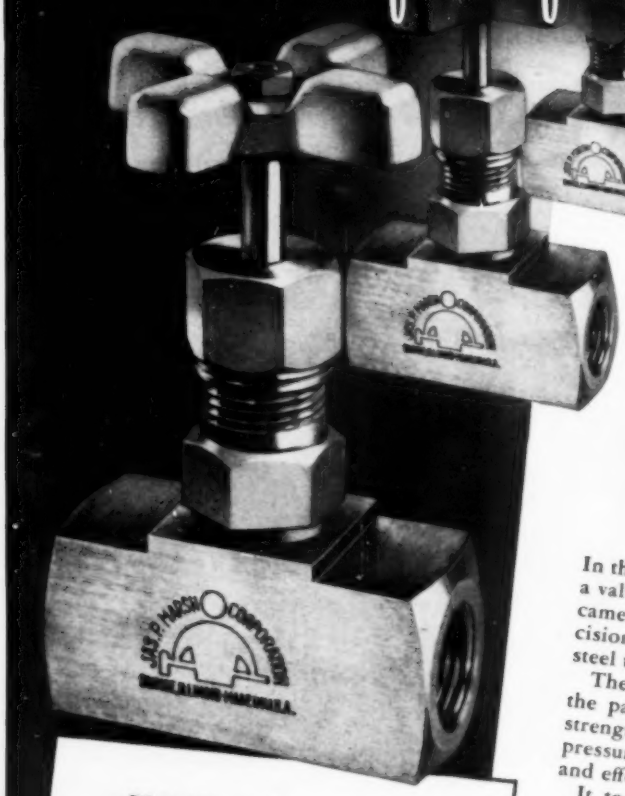
. . . easy to change—ask your Supply House.

RIDGID 65R is jam-proof—kicks out automatically when standard thread is cut. Threads 1" to 2" pipe or conduit with 1 set of dies that stay in threader. Change from size to size in only 8 seconds. Instant workholder setting. With new TC workholder, 65R is far the most for your money—ask your Supply House today!

RIDGID
Work-Saver Pipe Tools

The Ridge Tool Company, Elyria, Ohio, U.S.A.

Now the finest of needle valves is available



416 Stainless throughout...

In the Marsh Needle Valve, operating men found a valve that was better all the way through. Then came the call for a valve of like quality and precision for corrosion service . . . to be 416 stainless steel throughout.

The valve illustrated here is the answer. Like the parent valve, this new valve has safety and strength to spare . . . guaranteed for working pressures up to 10,000 psi . . . equally efficient and effective in any lower pressure range.

It too is machined from solid bar stock—in this case, 416 stainless steel. Its precision-ground and-machined stem is hardened 416 stainless. Packing is the special "Marpak" ring . . . one-piece, non-binding, long-lasting. So finely built is this needle throttling and cut-off valve that it can be easily throttled down to exceptionally fine regulation even on extreme pressure.

Read the list of features opposite. Then write for new bulletin No. NV-2 containing complete details.

The new all stainless valves (Series 1924) includes globe and angle patterns with double female connections in sizes ⅛", ¼", ⅜", ½", ¾", 1"; also globe and angle valves with male inlet and female outlet in sizes ¼" and ½".

MARSH INSTRUMENT CO. Dept. M, Skokie, Ill.
Sales affiliate of Jas. P. Marsh Corp.

Marsh Instrument & Valve Co. (Canada) Ltd.
8407 103rd Street, Edmonton, Alberta, Canada

HOUSTON BRANCH PLANT: 1121 Rothwell Street, Sect. 15, Houston, Texas

416 Stainless Steel ...all the way through!

- Body and stem guide machined from bar stock.
- Valve stem, hardened stainless.
- Packing, special Marsh "Marpak" moulded ring.
- Fine stem threads for strength and precision throttling.
- Deep inlet and outlet thread chambers.
- Bodies marked in accordance with MSS regulations.

Maximum Working Pressure 10,000 P.S.I.

Water, oil, gas or corrosive fluids not injurious to 416 stainless steel.

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Discriminating Traveler
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LARGE SCREEN TV in every room—and use of OLYMPIC SIZE SWIMMING POOL. Hot and Plae Steam Rooms at no charge to guests.
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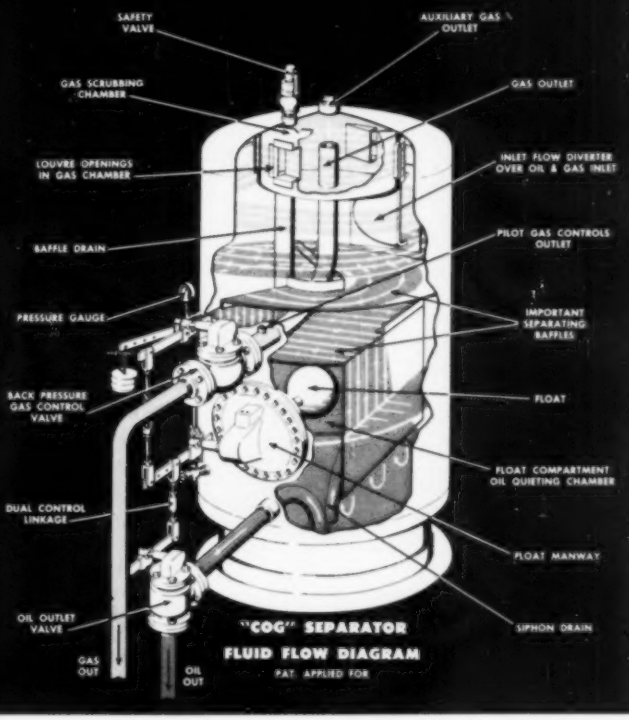
NATIONAL "COG"* SEPARATORS DO THE JOB

IT'S WHATS IN A SEPARATOR THAT COUNTS



FOR MAXIMUM CONSERVATION OF OIL AND GAS

FLOW DESCRIPTION

The incoming well fluid enters the separator through a specially designed extra heavy cast steel diverter that turns the well fluid against the circular side walls of the separator, thus giving the incoming fluid centrifugal motion. An adequate side wall wear plate at the inlet prevents wall erosion.

OIL STREAM

The oil travels circumferentially about the separator in a relatively thin film, thereby presenting a larger surface from which the entrained gas is "broken out." This larger oil surface contributes toward greater oil capacities. The greater the fluid volume at the inlet, the greater the initial fluid velocity and the longer the scrubbing travel against the side wall of the separator; that is, the higher the jet velocity at the inlet, the farther the fluid will travel around the side wall of the separator before coming in contact with the first horizontal baffle plate.

Here the liquid continues to be spread in a thin film forcing more gas to be liberated, then the liquid cascades from the first horizontal baffle plate down to the top of the quieting chamber to continue its travel in a thin film. The liquid flows over the quieting chamber roof and side wall. Note that oil is collected outside of the quieting chamber and has further opportunity to liberate entrained gas. The oil in this chamber containing the least entrained gas is drawn off the bottom and flows under the baffle into the final quieting chamber. The oil is withdrawn from the bottom of the separator through a siphon oil outlet.

Free gas is prevented from entering the quieting chamber which assists greatly in producing early equilibrium at the separator pressure. The quieting chamber provides a relatively quiet surface within the separator on which the float rides thus conveying smooth action to the oil valve actuating equipment.

GAS STREAM

The gas stream, after initial or inlet separation, travels a well designed tortuous path, such that proper velocities are maintained through the gas scrubbing stages. The gas stream undergoes centrifugal scrubbing against the separator shell, against the outer surface of the gas chamber and through numerous louvre openings in the chamber wall as it enters the chamber. Inside the chamber it is further scrubbed on the inner walls. The oil that is entrained with the gas is drained away from the scrubbing gas stream through the drain pipe to the quieting chamber.

NEW IMPORTANCE of DE-GASSING OIL

THE "COG" WILL HANDLE MORE OIL TO THE SAME DEGREE OF DE-GASSING THAN SEPARATORS OF THE SAME RETENTION VOLUME; or, DO A BETTER JOB OF DE-GASSING AT THE SAME THROUGH-PUT of other types of separators of the same retention volume.

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

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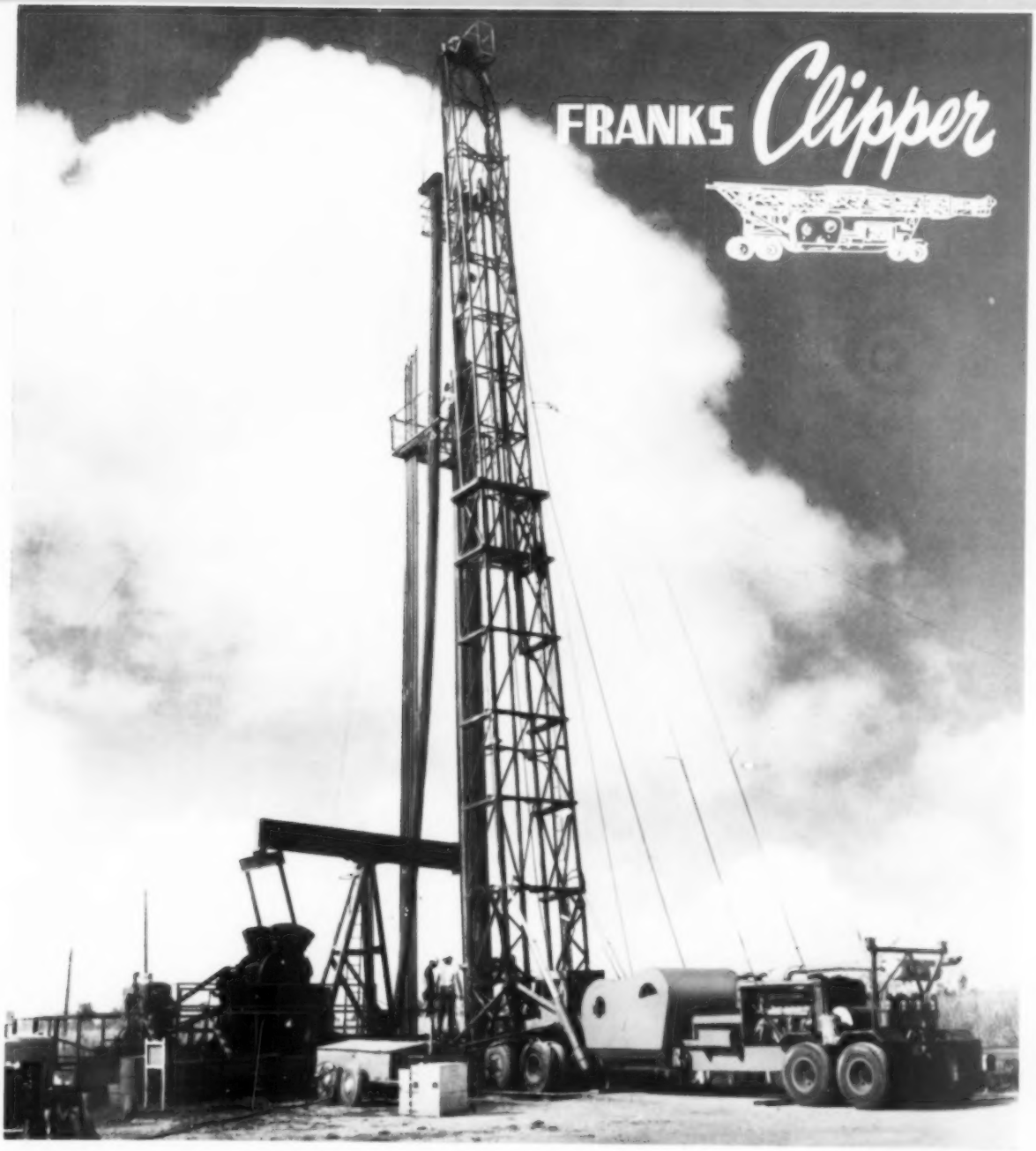


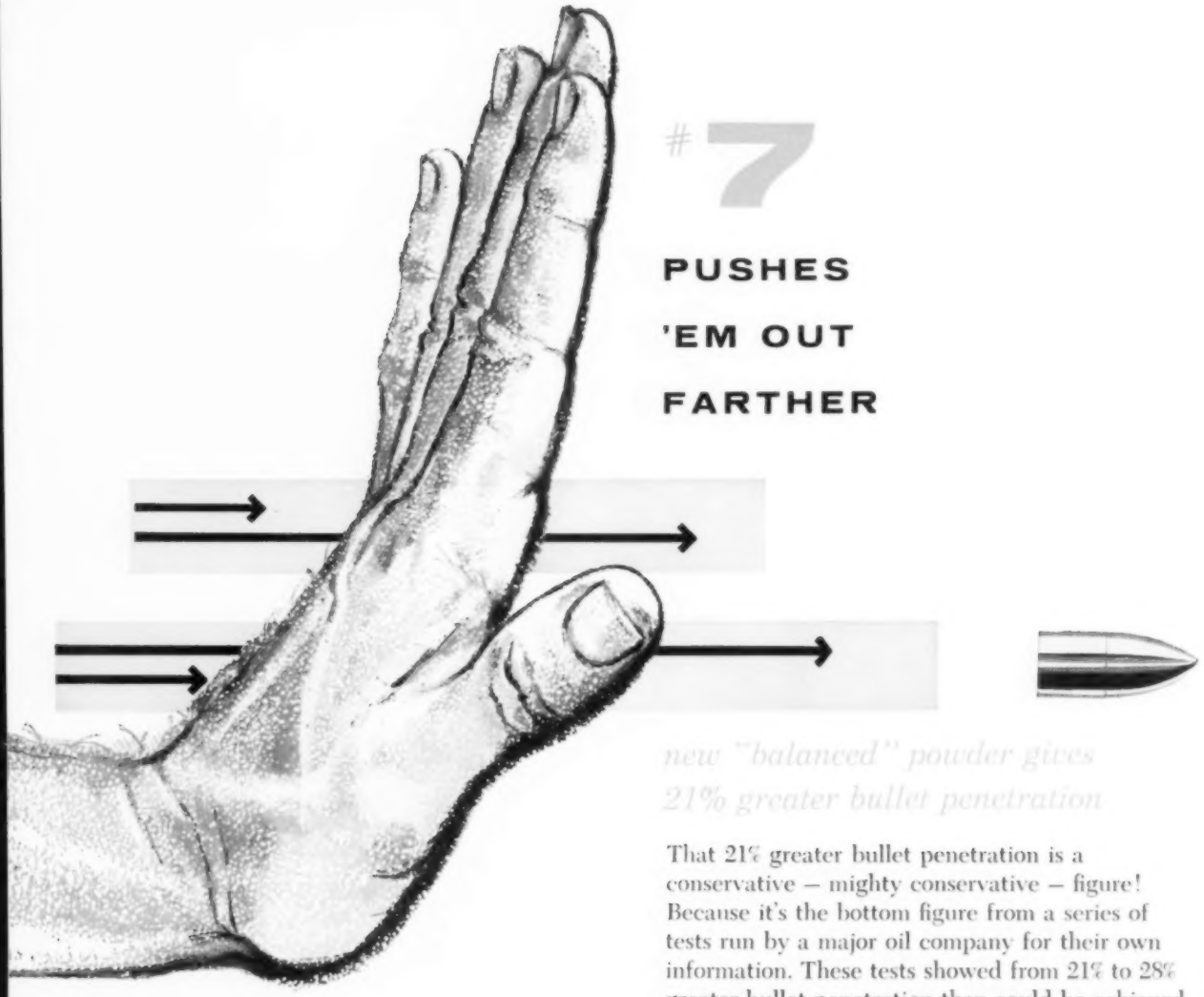
HANDLES WELL—Over the road or on the job!

See where you're going with a Franks CLIPPER—the *original* unit designed to *head into the well*. No more backing into tight locations and jockeying for position. The CLIPPER driver has a *front seat*. The engine is safely away from the well head. Fast rig-up? You bet! The CLIPPER derrick is raised and extended hydraulically. The unit travels fully strung up. Wide spread outriggers add stability. Up to 400 horsepower. Direct torque converter drive. And . . . the CLIPPER accommodates hydraulic accessories for servicing or workover. Four models, capacity range from 5,000 to 14,000 feet.

For specifications, performance data or prices . . . write . . . :
FRANKS Division, Cabot Shops, Inc., P. O. Box 3218, Tulsa, Oklahoma
"On the Spot" Field Service

WELL SERVICING AND DRILLING UNITS
FRANKS
DIVISION OF
TULSA, OKLAHOMA
CABOT

*REGISTERED TRADEMARK



#7

PUSHES 'EM OUT FARTHER

new "balanced" powder gives 21% greater bullet penetration

That 21% greater bullet penetration is a conservative – mighty conservative – figure! Because it's the bottom figure from a series of tests run by a major oil company for their own information. These tests showed from 21% to 28% greater bullet penetration than could be achieved with Lane-Wells #3 powder – and that was powerful powder, as the same tests showed. Lane-Wells new #7 powder is a new answer to the age-old ballistics problem of how to get more power behind the bullet without increasing the strain on the gun. #7 has been so formulated and "balanced" that it burns slower, with lower peak pressure, but *longer* . . . thus building up a tremendous "push" behind the bullet that drives it deeper into the formation. And there's no price premium for #7 powder – just another example of Lane-Wells efforts to give better service.

Tomorrow's tools – today!®

LANE WELLS COMPANY

General Offices, Export Office, Plant • 5610 So. Soto St., Los Angeles 58

LOS ANGELES • HOUSTON • OKLAHOMA CITY • LANE-WELLS CANADIAN CO. IN CANADA • PETRO-TECH SERVICE CO. IN VENEZUELA

Of Things To Come . . . In Oil

ANOTHER ROUND OF WAGE INCREASES may be forthcoming for oil company personnel. Standard Oil Company of Indiana is first to announce a 3 percent hike for non-union-represented employees in 15 midwestern states. Same increase has been offered union workers now negotiating for contracts. Most companies offered substantial raises for all personnel — over-and-above the cost of living hikes — a year ago.

CONTRACT DRILLING FOOTAGE PRICES may be necessarily increased in the near future to absorb increased drilling costs, hints Brad Mills, AAODC executive vice president. In his report recently released, 1956 weighted average contract cost per foot was $4.75, representing only 34 percent of total drilling costs which average $13.75 per foot. In 1944, contract cost was 57 percent of total, which included materials and service costs purchased directly by the operator.

OIL MEN WON'T LIKE WHAT THEY READ when numerous government agency investigations release their reports. Several such studies are underway and more planned, and, it appears that the producer will be in for a round of criticism. Among items slated for investigation are: crude oil (and gasoline) price increases; tax structure; lobbying; oil to Europe program; and monopoly charges in marketing. It may be a rough year to get favorable legislation on a natural gas bill, settle ownership of tidelands.

FOUR CORNERS AREA TO GET CRUDE OUTLET if reported plans are carried out. Although only two companies, Shell and Standard of California, are associated with the pipe line project, several other companies may be involved. Tentative plans call for a 16-in. line direct from the San Juan Basin to Los Angeles, capable of pumping up to 100,000 bbl daily.

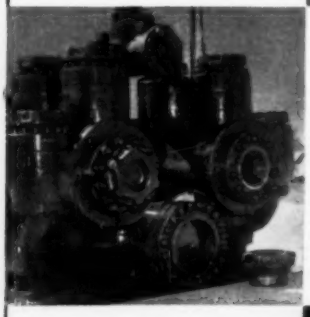
TEXAS SHUTDOWN EXEMPT POOLS may brew more dissension in months to come. Lines are drawn between producers who have most of their wells under proration and those who have shutdown exempt wells, mostly secondary recovery projects. So far the latter have won the non-exempt battle, but opponents will be heard from when more ammunition is ready. The primary question: Does curtailed production effect ultimate recovery from secondary recovery projects?

SECONDARY RECOVERY RESEARCH IS GUARANTEED through a new program furthered by Penn Grade Crude Oil Association. College of Mineral Industries at Penn State will do the research, focusing work on in-situ combustion and miscible-phase displacement. Purpose is to devise methods to sustain Penn Grade crude production.

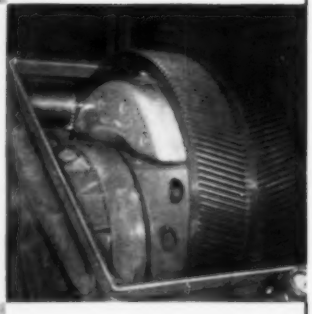
Gardner-Denver Builds

TO SPEED DEEPER DRILLING . . .

Dual, gear-driven oil pumps. Assure full lubrication at all times. Driven directly from the helical gears.

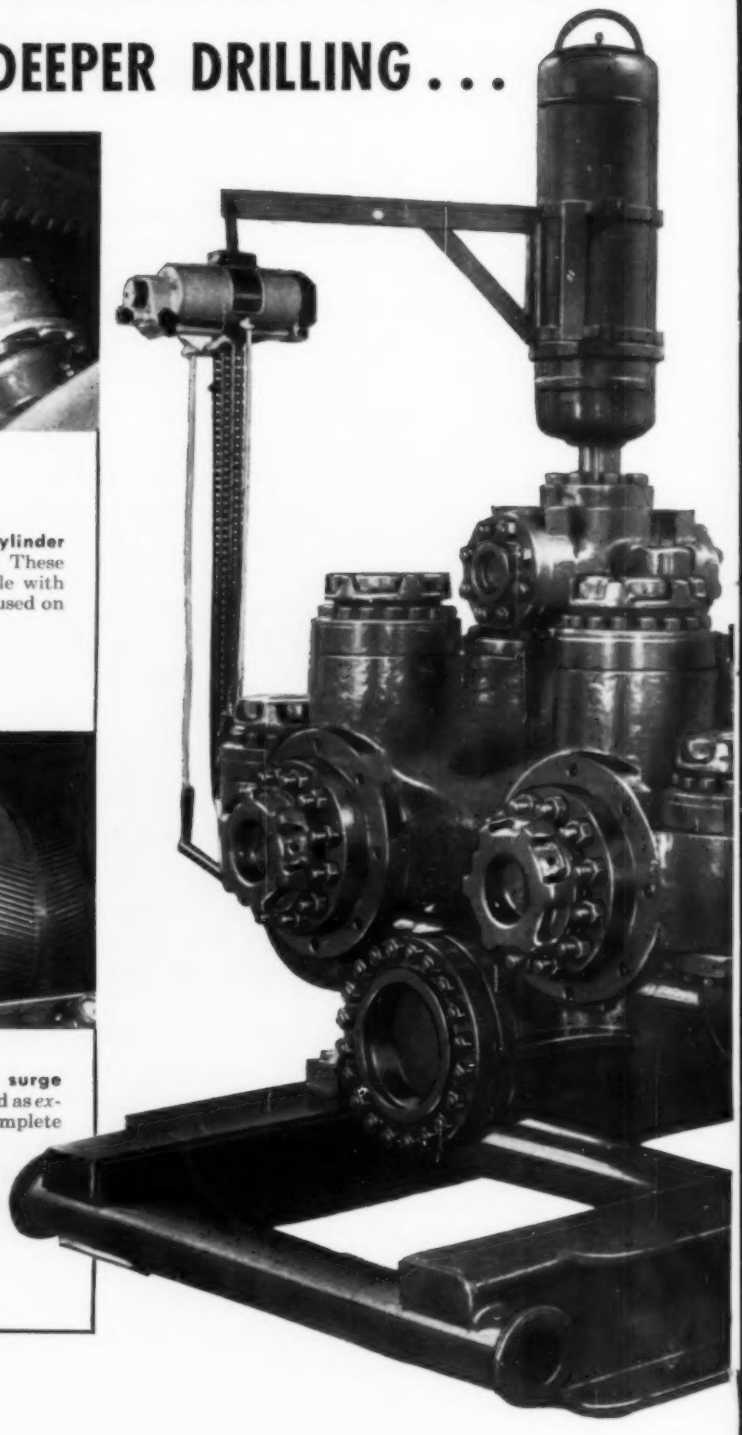


Threaded fluid cylinder locks and rings. These are interchangeable with valve cover locks used on valve pots.



Counterbalanced eccentric. This exclusive GH-GXH feature helps reduce unbalanced forces usually transmitted to the pump foundation or mounting platform.

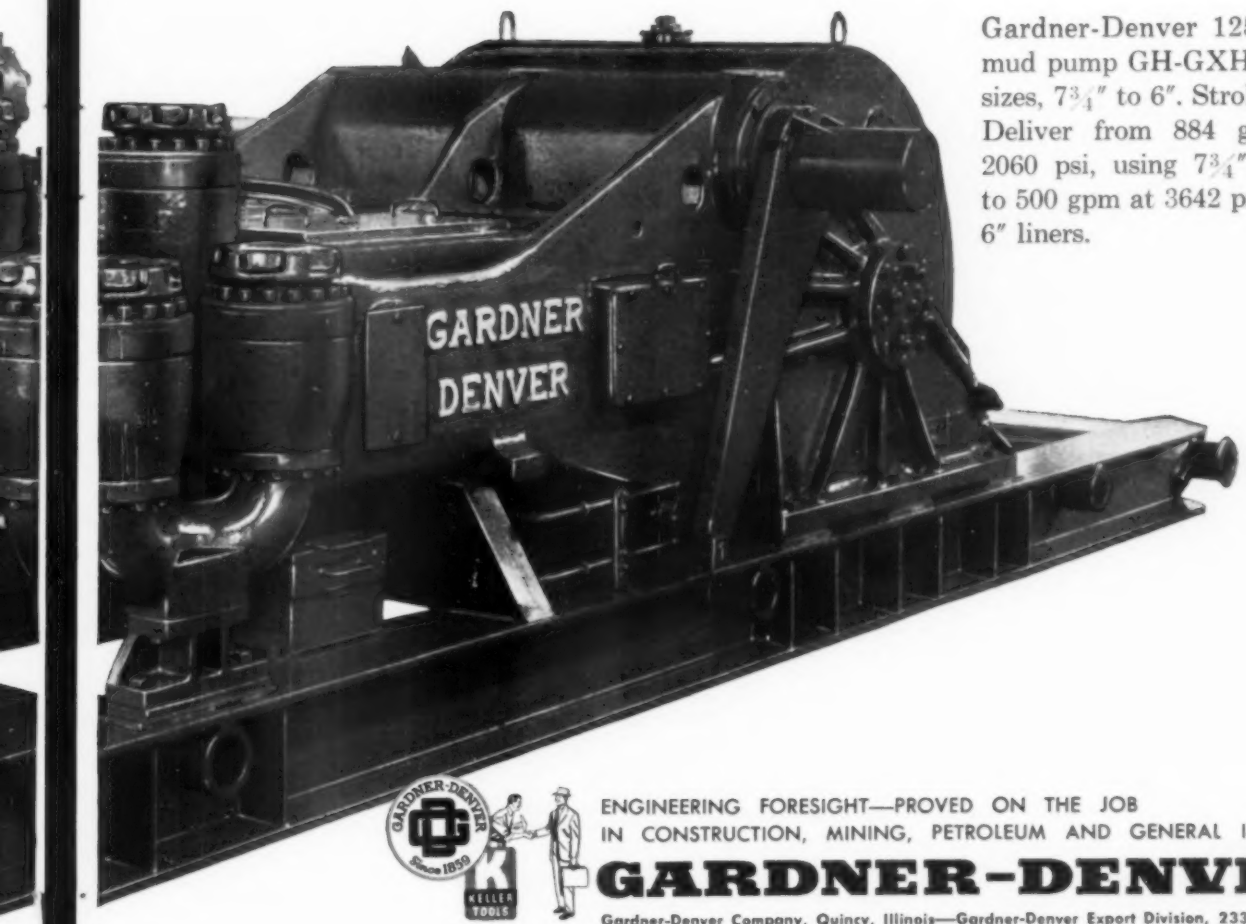
Newly designed surge chamber. Furnished as *extra equipment*, complete with boom, Keller half-ton hoist, trolley, filter and lubricator, and 8′ air hose. Simplifies handling of heads, valve locks, liners, etc.



Giant 1250 h.p. Mud Pump

TO PROTECT YOUR HUGE WELL INVESTMENTS

This pump is now being manufactured in regular production. Confer with your Gardner-Denver distributor or write Gardner-Denver about your special mud pumping problems, and for details of the Gardner-Denver GH-GXH 1250 h.p. mud pump.



Gardner-Denver 1250 h.p. mud pump GH-GXH. Liner sizes, 7¾" to 6". Stroke, 18". Deliver from 884 gpm at 2060 psi, using 7¾" liners, to 500 gpm at 3642 psi, with 6" liners.

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NOW AVAILABLE – *Technical paper "A Method for Neutron Derived Porosity Determination for Thin Beds". Write McCullough Tool Company, 5820 South Alameda St., Los Angeles 58, California.*

McCullough Log Enables Precision Perforating of 5′ Pay Zone

Discovers 8′ Error in Electric Log and Casing Measurements

Operator of this old well ran an electric log which located a new, possibly productive, 5′ sand.

McCullough was then called to run a Neutron Log. The Neutron curve confirmed the productive possibilities of the new zone, but also discovered that both the electric log and casing measurements were 8′ in error.

The well was plugged back to 6800′ and perforated according to McCullough measurements.

Thirty ½″ improved Ogival Bullets were shot in the 5′ sand in one run by a 3½″ O.D. McCullough M-3 Gun. Casing was 5½″ O.D. 17 lb.

The well started flowing through the casing before the M-3 Gun was out of the hole.

If the McCullough Radiation Well Logger had not discovered the 8′ measurement error, the 30 shots would have missed the pay zone entirely.

It always pays to rely on the accuracy and dependability of McCullough's Radiation Well Logger.

McCullough Log Locates and Defines 11 New Pay Zones

Accuracy of McCullough Radiation Well Logger Permits Sharp Shooting of 11 Thin Zones for 138 B/D Increased Production

This was an old well in an established California oil field. Production had fallen to five barrels of oil per day.

Believing better production was possible, the operator decided to log and re-perforate the well. McCullough's combination Gamma Ray-Neutron Log was run from 4380′ to 5645′, locating several small, promising stringers of untried sands above the original pay zones.

A simultaneous collar log accurately located casing collars in relation to these thin sands, thus assuring "pin-point" accuracy in perforating.

The two original producing sands were re-shot, four holes per foot, with 26 improved ½″ Ogival Bullets from McCullough M-3 Guns and with 26 McCullough Standard Casing Glass Jets.

Above these zones were the 11 small sand stringers ranging in thickness from 4 feet to 13 feet. Intermediate zones, lying between the productive sands, which were not to be perforated ranged in thickness from 5 feet to 103 feet.

Accurate measurement means "putting the shots where they count"... and the "pin-point" accuracy of the McCullough Radiation Well Logger makes sharp shooting of thin zones practical... assures uniform perforating coverage of any zone, thick or thin.

The 11 pay sands were perforated with 256 shots, four holes per foot, by 3½″ O.D. McCullough M-3 Perforators firing ½″ Ogival Bullets. Production increased from 5 to 143 barrels of oil per day.

This is only one of many actual jobs where the accurate, reliable, easily interpreted information provided by the McCullough Radiation Well Logger has located and defined multiple pay zones, tied-in casing collar locations and permitted precision perforating for best possible production.

McCullough® TOOL COMPANY

Cable Address: MACTOOL

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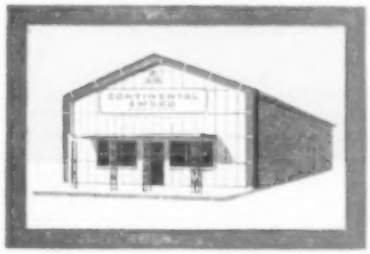
Now joined as one Company, Continental-Emsco is better established to give the industry the ultimate in service and product excellence.



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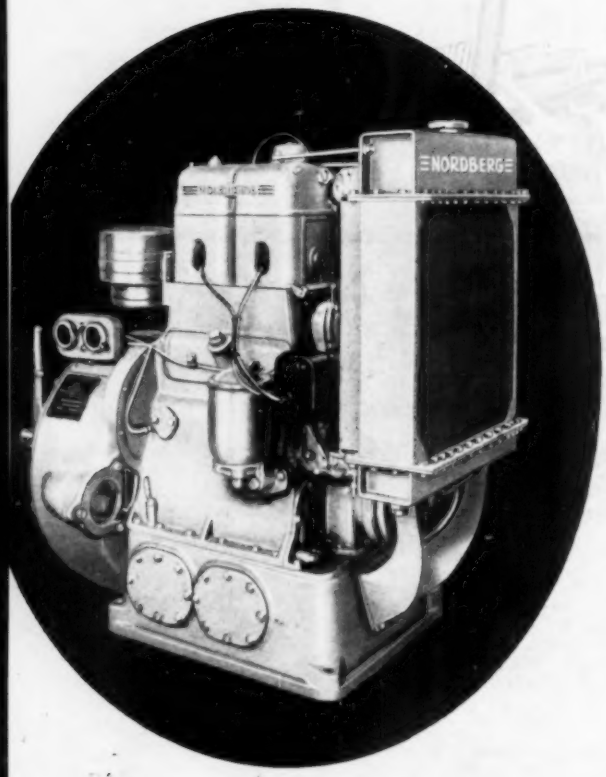
NORDBERG

POWER CHIEF®

OIL FIELD ENGINES



• Nordberg Power Chief Gas Engines are now built in compact single-cylinder and two-cylinder sizes, rated from 18 to 36 horsepower at medium speed to handle a wide range of pumping requirements.

. . . setting new records for 'round-the-clock PRODUCTION PUMPING

• Before you consider *any* production pumping engine, it will pay you to consider that Nordberg *Power Chief* Gas Engines are setting new records for 'round-the-clock service. Many actual *Power Chief* case histories show over 30,000 hours of continuous pumping operation—*with original rings, pistons, liners, bearings and crankshaft still in place!*

Here, then, is positive proof that Nordberg *Power Chief* engines really deliver the kind of rugged, day-in, day-out power you need for dependable production pumping service at the very lowest maintenance cost.

For further details, mail the coupon today.

NORDBERG MFG. CO., Milwaukee, Wisconsin

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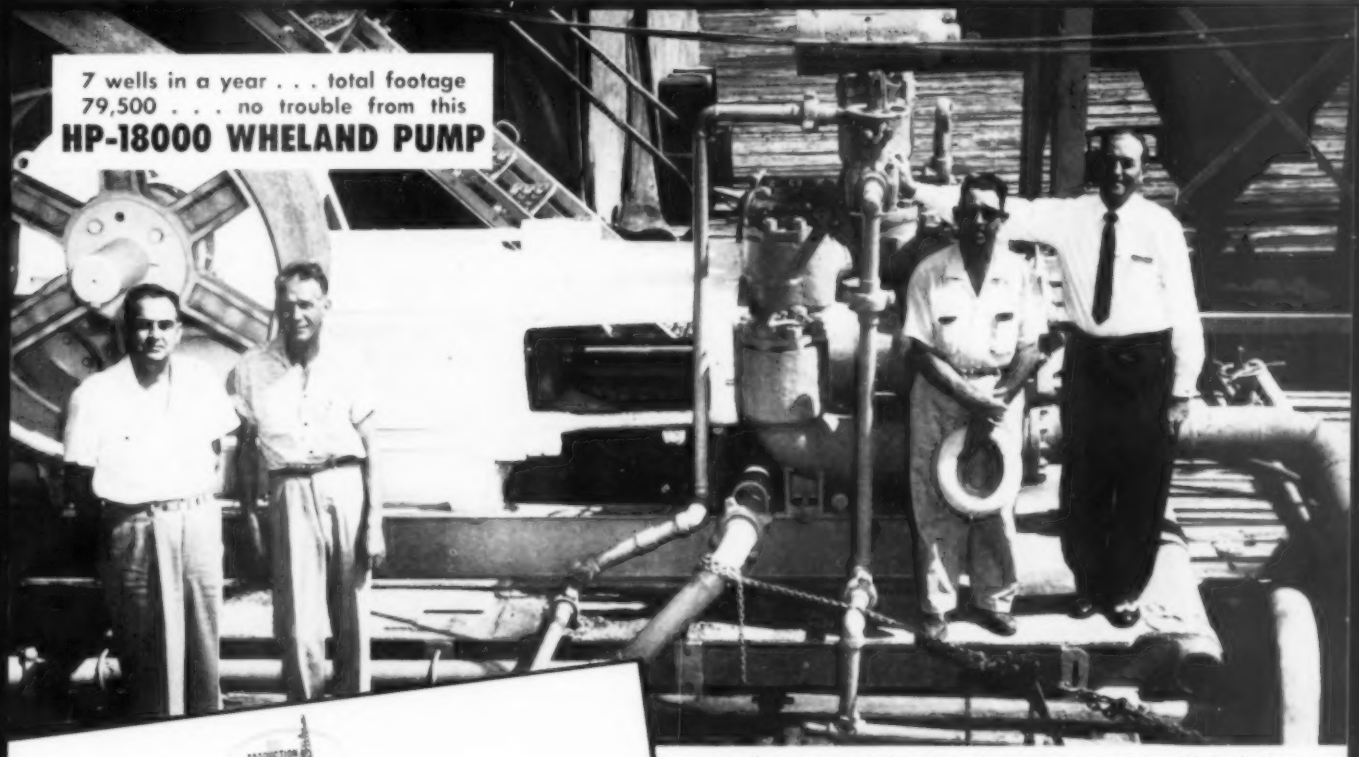
MEAD ENGINE & WELDING WORKS, Sterling, Kansas

CORNELISON ENGINE MAINTENANCE CO., INC., Seminole, Oklahoma

ROGERS DIESEL ENGINEERING CO., New Orleans, La.

7 wells in a year . . . total footage 79,500 . . . no trouble from this

HP-18000 WHELAND PUMP



Installation view of the Wheland HP-18000 owned by Oil Production Maintenance, Inc., Houston, Texas. Left to right: Messrs. J. K. Butler, President; Tracy East, Wheland Serviceman; "Pop" Woods, Tool Pusher; Harris Lodge, Homco Salesman.

OIL PRODUCTION MAINTENANCE, INC.

HOUSTON 21, TEXAS

September 13, 1956

Mr. Gordon P. Street, President
The Wheland Company
Chattanooga, Tennessee

Dear Mr. Street:

Oil Production Maintenance, Inc. owns and operates two Wheland power pumps. One is a HP-14000 Wheland and the other is a HP-18000. Both of these pumps have been in operation approximately twelve months. We have experienced no difficulty either with the power end or the fluid end of either of these pumps over this period of time. Both of these pumps have been operated within approximately ten per cent of their rated capacities for the full twelve months.

During the twelve months period, the rig which operates the HP-18000 Wheland has drilled seven wells. They have varied in depth from 10,500 feet to 15,000 feet. The total footage accumulated by this rig during this time has been approximately 79,500 feet. We hope, and have every reason for our belief, that the pumps will continue their efficient operation for several years to come.

Yours very truly,

OIL PRODUCTION MAINTENANCE, INC.

J. K. Butler, President.

JKB:ml

OWNS 2 WHELAND PUMPS here's the report!

DEPENDABLE OPERATION!

". . . every reason for our belief that the pumps will continue their efficient operation for several years to come."

HP-18000 7¾" x 18", 750 HP Nominal Input at 60 RPM. Discharge Pressure with 7¾" liner 1322 PSI; with 5½" liner, 2700 PSI.

HP-14000 7½" x 14", 350 HP Nominal Input at 60 RPM. Discharge Pressure with 7½" liner 838 PSI; with 5½" liner, 1627 PSI.

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THE WHELAND COMPANY

CHATTANOOGA, TENNESSEE, U.S.A.

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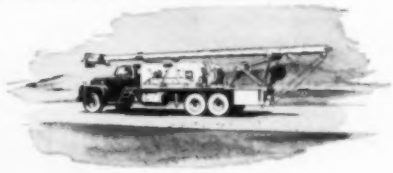
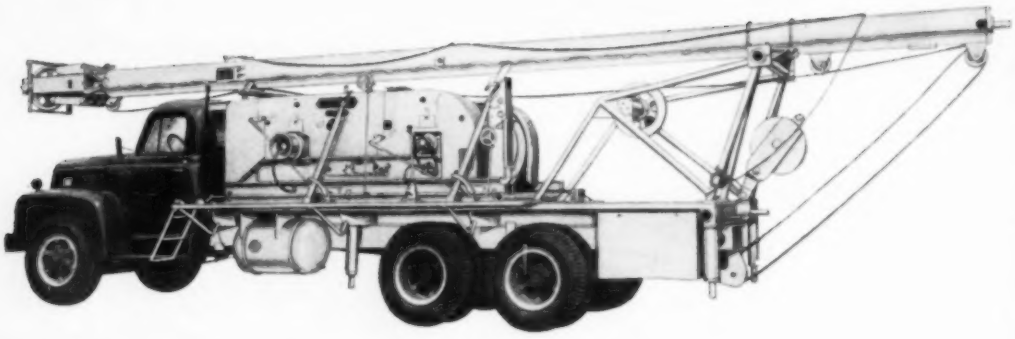
EXPORT DISTRIBUTORS: LUCEY EXPORT CORPORATION—233 Broadway, New York 7, New York—Broad Street House, London, E. C. 2, England.

ON THE JOB ... BETWEEN JOBS ...





that's

cardwell's

model K 203

Because it's designed for faster moving . . . faster rig-up and tear-down . . . faster on the job performance, use of a Cardwell MODEL K203 Double Drum Servicing Hoist results in hard-money savings! It combines rugged-duty construction with lightweight mobility . . . is depth rated to 9,000 feet for well servicing, swabbing, etc. . . . and is equipped with a Cardwell 140,000 pound capacity telescoping pipe mast as standard equipment . . . telescoping stinger available.

Located well forward to provide ample rear deck storage for tools, blocks and other equipment, the hoist features a fully enclosed oil-bath input drive. Remote control is provided for 5 forward and 1 reverse speed, gear transmission and Cardwell Flex-Disc air friction clutches are used throughout.

Easy to handle—on the road or in the field—Cardwell's K203 *speeds* the job—to save time and dollars!

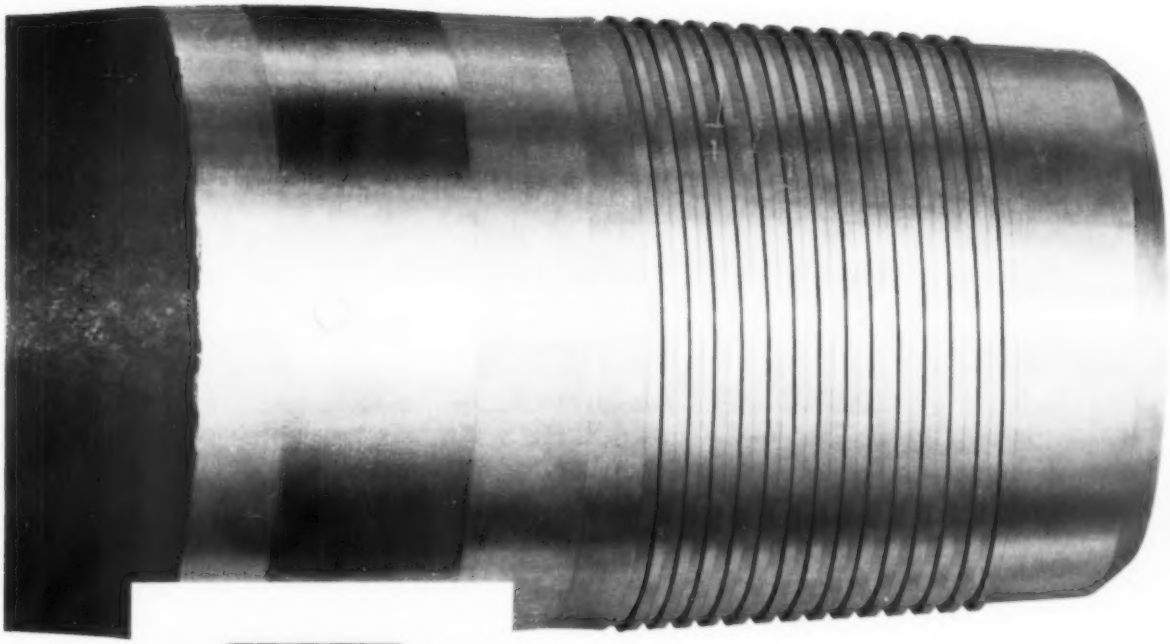
cardwell MANUFACTURING COMPANY P. O. BOX 2001, WICHITA, KANSAS

A-9-67

COLD ROLLED

HERE'S GOOD NEWS

for operators who prefer replaceable tool joints!



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A DEVELOPMENT OF

HUGHES TOOL COMPANY

HOUSTON, TEXAS

You can now get the improved HUGHES "Seal-Grip" drill stem assembly that has been especially designed to withstand the increased stresses of deeper drilling. The new assembly is the result of the development and perfection by Hughes of new equipment and techniques for cold-rolling the large land area of drill pipe for "Seal-Grip" tool joints.

The value of cold-rolling has been strikingly demonstrated in a long series of laboratory and field tests. For instance, in laboratory fatigue tests—where pipe is run to destruction—*we have not been able to induce a single failure* in the cold-rolled area of the pipe.

HUGHES "Seal-Grip"—always dependable—now offers the operator the strongest, most versatile and efficient replaceable tool joint assembly he can buy.

Developers of "Flash-Weld," "Seal-Grip" and Counter Bore Weld Tool Joints

YOUR GUARANTEE OF PERFORMANCE

In the oil fields of the world the HUGHES trademark has been accepted as a guarantee of performance . . . *consistent, dependable performance* — for almost a half century. Through intensive and aggressive research, in the laboratory and in the field, HUGHES is continuing to advance the quality and performance of its products . . . worldwide.

BEGINNING
OF THE END
of corrosion troubles
When the Kontol engineer starts his preliminary testing, the end of production problems caused by corrosion is in sight. After the preliminary testing is completed, and a protective dosage is recommended, the Kontol engineer continues to check results, to be sure that the protection gained is in the order he originally predicted.
Tretolite Company service engineers are salaried treating experts who live in the area they service. Their job is to give continuing service and to see to it that Tretolite Company products live up to their reputation.
Prove this to your own satisfaction. On your next treating or corrosion problem, call the Tretolite engineer in your area.
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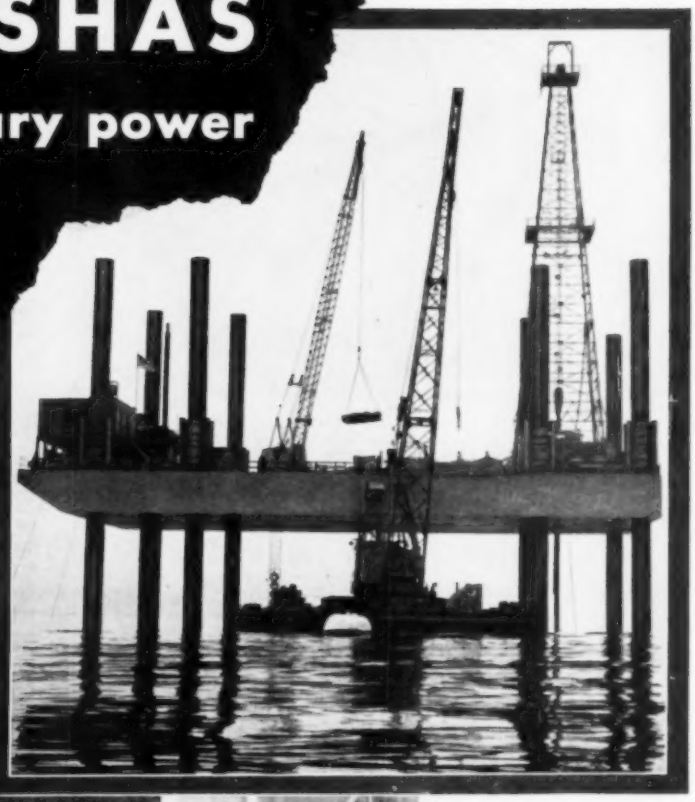
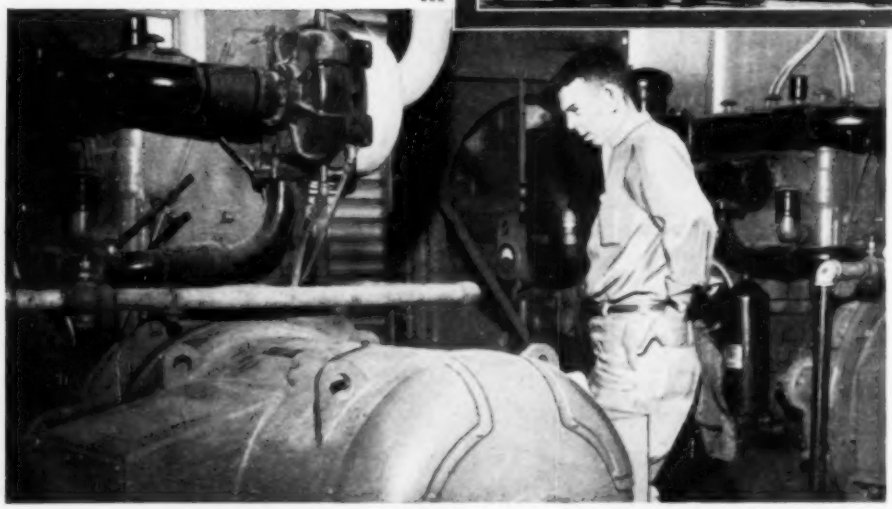
WAUKESHAS *supply* auxiliary power for Pacific Driller No.1

on first mobile offshore drilling platform to operate off West Coast





Off HUNTINGTON BEACH, California—about 9800 ft. out, in 60 ft. of water, in State Lease 1552, is Pacific Driller No. 1. Capable of drilling to 20,000 ft. depths, it is owned and operated by Offshore Constructors, Inc. Drilling contractor is Sun Marine Drilling Corp.

●

Auxiliary Power by WAUKESHA TURBI-DIESELS Two Model WAKD8SU—six cyl., 6¼-in. bore x 6½-in. stroke, 1197 cu. in. displacement—drive two 100 KW generators . . . furnished by Frazier Wright Co.

• TURBO-SUPERCHARGED for greater power at lowest fuel cost—Waukesha Model WAKDBS engines are heavy-duty, six cylinder, four-cycle, full Diesels of 1197 cu. in. displacement, with seven-bearing counterbalanced crankshafts. In their unique, patented combustion chambers, all modern "high speed Diesel fuels" of 45 cetane or better burn cleanly. Starting is prompt, acceleration quick, and performance is lively. The Waukesha exhaust turbocharger system of supercharging increases horsepower with a minimum of parasite load; improves over-all fuel economy throughout the speed range. Get the details in Bulletin 1618. *Waukesha Motor Company, Waukesha, Wis., New York, Tulsa, Los Angeles.*

WAUKESHA Engines and Power Units: 10 hp to 1135 hp—LP Gas • Natural Gas • Normal and Turbocharged Diesels—Get Bulletin 1079

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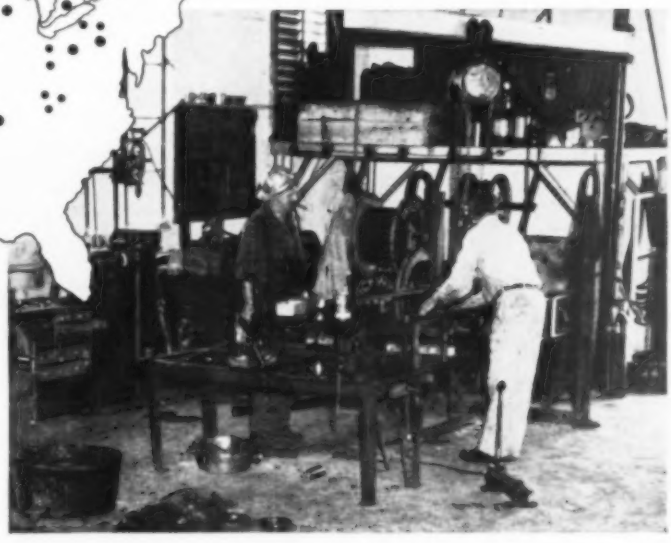

Here's an up-to-date list of 39 distributor outlets for Bucyrus-Erie spudders, located throughout the United States and Canada in every major oil field. There's a distributor near YOU — *always ready* to fill your equipment needs, *always able* to provide fast, dependable parts, tools and repair service. See him soon and take advantage of his years of field experience, wealth of cost-cutting ideas, and eagerness to satisfy. He's in business to help *you make money* . . . to analyze your drilling problems and to recommend ways *you can solve them*. And you will do BOTH with Bucyrus-Eries.

FIRST with the FINEST in Spudders

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BUCKEYE SUPPLY CO. OF KANSAS, INC. . . . . . Wichita, Chase, Arkansas City, Great Bend, and El Dorado, Kan.
CABLE TOOL SUPPLY CO. . . . . Princeton, Ind.
DRILLERS SUPPLY CO. . . . . . Joplin, Mo.
DRILLING AND MINING EQUIPMENT CO. . . . . . Los Angeles, Calif.
GREAT NORTHERN TOOL & SUPPLY CO. . . . . . Billings, Cut Bank and Kevin, Mont.; Casper, Wyo.
IVERSON SUPPLY CO. . . . . . Tulsa, Oklahoma City and Okmulgee, Okla.; Ft. Worth, Dallas, Midland, Odessa and Snyder, Tex.; Artesia and Farmington, N.M.
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There is a

The S. M. Jones Company program of continuous

ADVANCED RESEARCH and DEVELOPMENT

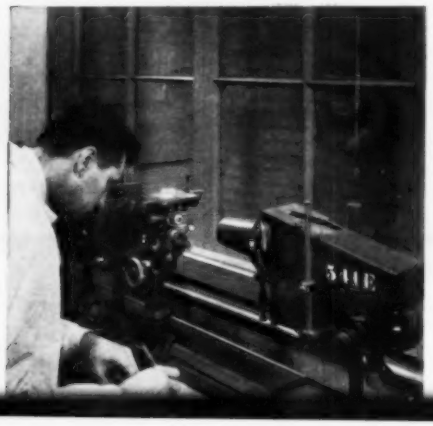
The Jones guiding principle is:

"Yesterday's solution of well problems is seldom good enough for today."

From its beginning in 1891 Jones has continuously carried on experimental designing, laboratory testing, and field testing in order to solve the problems of ever-deeper wells.

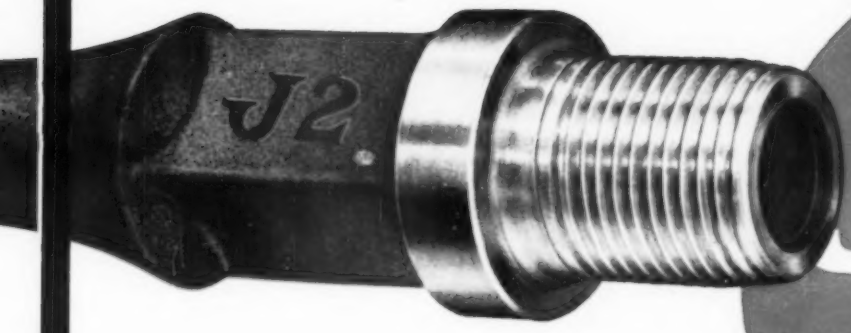
Advancement and improvement is what the oil producer wants and will always get in Jones Sucker Rods.

The physical microstructure of potential sucker rod materials is studied at magnifications up to 1500 times. Every material and every process must meet Jones high standards.



Deeper wells and heavier loads bring on an ever-increasing demand for higher strength materials. Experimental tensile testing of new materials is a continuous project.

difference in sucker rods



TYPE 2

JONES

carbon manganese SUCKER RODS

For medium to heavy pumping loads in non-corrosive fields. Offers quality and service unexcelled.

A very high grade carbon manganese steel made to Jones specifications, fully normalized, descaled and shot peened to add strength and endurance.

Specify Jones Sucker Rods for proved longer life.

FOUR TYPES OF JONES SUCKER RODS FROM WHICH TO CHOOSE

Type	Identification	USE	DESCRIPTION	PHYSICAL PROPERTIES					
				Yield 1000 psi	Ultimate 1000 psi	% Elong. in 8"	% Red. of Area	Izod	Brinell Hardness
J-12	Protector ends painted BLUE	For heavy pumping loads under all conditions	Made from processed electric furnace steel with high yield strength and excellent fatigue resistance.	95-105	110-125	12-17	65-75	90-110	229-260
J-8	Protector ends painted BLACK	For extremely heavy pumping loads	A special alloy steel of exceptional yield strength and well-balanced physical properties.	100-115	120-135	10-15	50-60	85-85	240-260
J-7	Protector ends painted ORANGE	For medium to heavy pumping loads under all conditions	Called "standard of the industry". Strong, corrosion resistant nickle molybdenum steel, fully normalized, tempered, descaled and shot peened for further fatigue and corrosion resistance.	65-80	85-100	14-22	60-70	90-107	170-210
J-2	Protector ends painted WHITE	For medium to heavy pumping loads in non-corrosive fluids	High grade carbon manganese steel, fully normalized, descaled and shot peened to add strength and endurance.	60-75	90-105	18-24	60-70	60-90	160-210

Jones Pony Rods carry the same physicals as Jones Sucker Rods. Always use proved superior Jones Pony Rods with proved superior Jones Sucker Rods.

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION

THE S. M. JONES COMPANY

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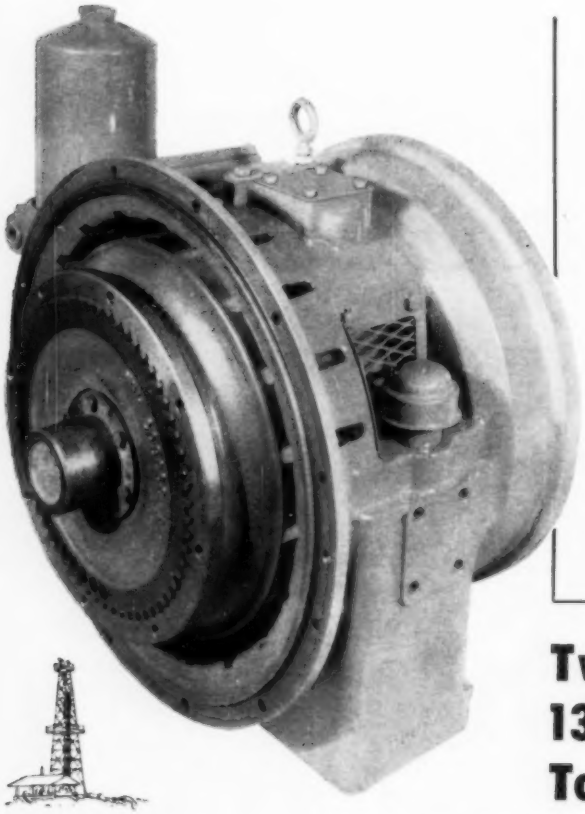
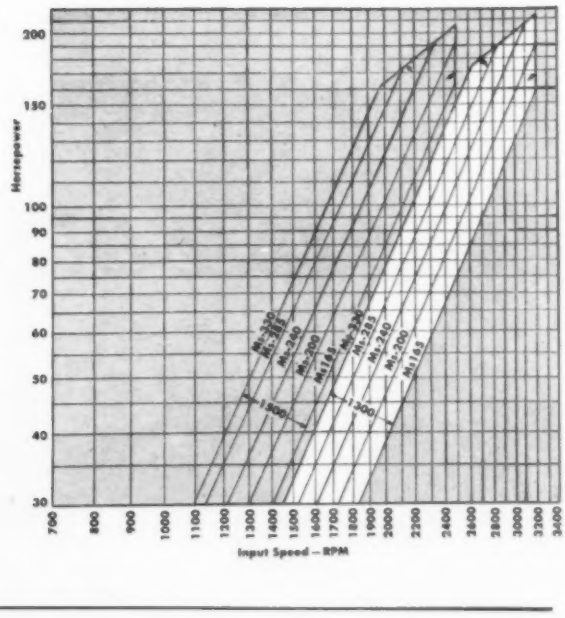
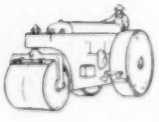
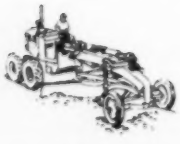




Twin Disc offers new 1300 Series Single-Stage Torque Converters





To meet the growing trend toward higher speed diesel and gasoline engines, Twin Disc Clutch Company announces its new 1300 Series Single-Stage Torque Converters . . . a series that offers ideal torque ratings for shovels, materials handling equipment, small industrial locomotives, front-end loaders, hoisting machinery, road rollers, graders and many similar applications.

The new 1300 Series Single-Stage Torque Converters are rated from 30 hp at 1450 rpm to 212 hp at 3200 rpm . . . with impellers available for specific torque ratings of 165, 200, 240, 285 and 330 pound-feet.

Current production of the 1300 Series consists of one model—the Model "F." This is a spacer-type arrangement with an SAE No. 2 flywheel housing size and either an SAE No. 2 or No. 3 output housing.

Like the Twin Disc 1500 Series Single-Stage units, the 1300 Series has an exclusive blade design which develops a counter-head at high-speed ratios, stopping fluid circulation. This simplifies design and construction and eliminates the need for a free-wheeled stator.

Impellers having different bladings (both number of blades and pitch) are interchangeable, permitting torque capacities to be matched more accurately to engines of various hp sizes and speeds.

The 1300 Series cooling requirements are minimized because of a rotating impeller housing which provides air circulation through the ventilated stationary housing.

If you've been considering a torque converter in your machinery designs, or are dissatisfied with your current single-stage units, investigate today the benefits offered by the new Twin Disc Single-Stage Torque Converters. Write for Bulletin 508 Supplement.

TWIN DISC

TWIN DISC
Torque Converters

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

Branches or Sales Engineering Offices: Cleveland • Dallas • Detroit • Los Angeles • Newark • New Orleans • Tulsa

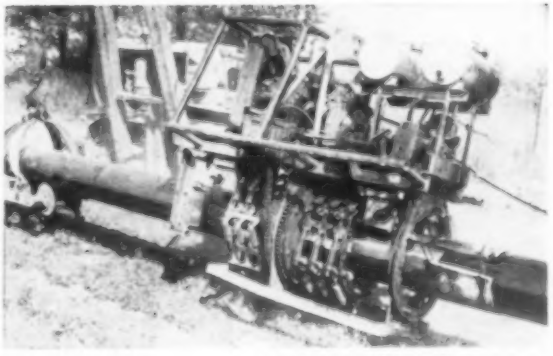
(Left) NO-OX-ID and NO-OX-IDized Wrapper application by Traveliner. (Right) NO-OX-ID kettle.

3-PIECE OUTFIT FOR WELL-DRESSED PIPE

This carrier pipe is being well dressed for years of uninterrupted service underground. A 3-piece outfit—cleaning machine, dope kettle and Traveliner—does the job.

The dressing? NO-OX-ID Coating and NO-OX-IDized Wrapper—a combination that provides chemical-mechanical protection against corrosion and destructive soil action. NO-OX-ID is applied hot or cold by hand or machine...over the ditch or at the mill. No noxious fumes. You save on material because less NO-OX-ID coats more pipe per day. NO-OX-ID Coating and Wrapper combinations shield against corrosion attack.

On your next transmission or distribution line coating job, consult with your Dearborn Pipeline Engineer. Ask him to recommend the NO-OX-ID combination best suited to your requirements. Cost is reasonable and the protection long lasting. The best dressed pipe is NO-OX-ID PROTECTED!



Cleaning and priming prior to coating.

Mail coupon for factual information on NO-OX-ID Coatings and NO-OX-IDized Wrappers

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Specify NO-OX-ID combinations for long-term protection

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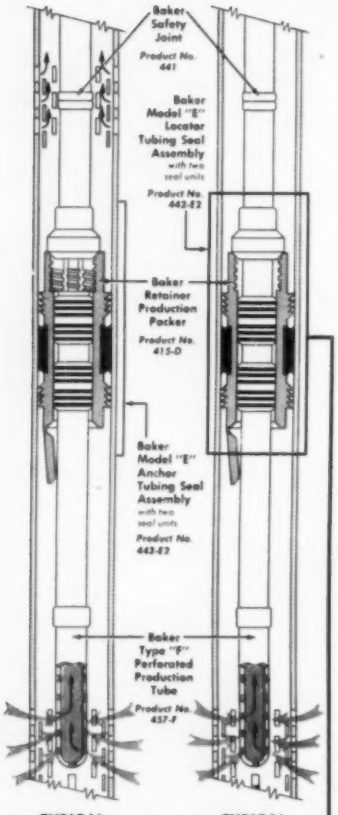
SINGLE ZONE

DUAL ZONE
PRODUCTION

WITH **1** **BAKER**


Baker Safety Joint
Product No. 441
Baker Model "E" Locator Tubing Seal Assembly with two seal units
Product No. 442-E2
Baker Retainer Production Packer
Product No. 415-D
Baker Model "E" Anchor Tubing Seal Assembly with two seal units
Product No. 443-E2
Baker Type "F" Perforated Production Tube
Product No. 457-F
TYPICAL DUAL ZONE HOOKUP
TYPICAL SINGLE ZONE HOOKUP

Right: Picture shows actual detail of seal units

RETAINER PRODUCTION PACKER

Do you know that with only ONE Baker Retainer Production Packer you can equip your well for *either* SINGLE ZONE or DUAL ZONE production? And that you can accomplish *any* type of completion for *any* method of production to meet *fixed* or *changing* well conditions?

A single Baker Retainer Production Packer will also outperform many specialized tools when used as a TESTING PACKER • SQUEEZE PACKER • GAS LIFT PACKER • PERMANENT COMPLETION PACKER • WATER FLOOD PACKER • GAS INJECTION PACKER • CORROSION CONTROL PACKER • TUBING ANCHOR • ONE-WAY BRIDGE PLUG • PERMANENT BRIDGE PLUG.

Every production man should be familiar with the many operating advantages of this "Universal Type" Packer, which include . . .

WIRE LINE SETTING • SETTING UNDER HIGH PRESSURE • NO EXCESSIVE "SET-DOWN" WEIGHT OR TENSION • HOLDS PRESSURE FROM ABOVE OR BELOW • PACKS-OFF AND HOLDS UNDER HIGH BHT • RESISTS CORROSION • EASILY DRILLABLE.

Ask any Baker representative or office for complete details. There is no charge and no obligation for specific recommendations and completion planning advice available from Baker Technical Advisers. Why not be prepared for your next completion?

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BAKER
RETAINER PRODUCTION PACKER

If your well is worth completing . . . it's worth completing well

Deepest two-string dual completion is Sun Oil Company's well No. 2 on State Tract 2620 at Lake Pelto on the Louisiana Coast. This No. 2 well was completed as a two-string dual oil producer from perforations at 15,738-63 ft and at 16,074 to 16,084 ft where it found new producing horizons. In the photo Sun's No. 1 well is at left, storage barge in center, and Brewster and Bartle drill barge, "The Vermilion Bay," is drilling well No. 2. These are two wells that found deep oil and gas production in 1956. — *Photo courtesy Sun Oil Company*

P 422

11th Annual Survey

150 Deep Wells Cost $100,000,000 in 1956

Thirteen fields began producing from below 15,000 ft last year, making 23 fields with deep production. Operators have spent a total of $262,000,000 on 409 deep wells in U. S.

Ernestine Adams

A few years ago the devil himself could have bargained for concessions below three miles in the earth. Today an exclusive lease would cost more than all the brimstone he's got. (We hope.)

The year 1956 was a revealing period — it gave a glimpse of both the great potentials of energy the depths hold and the great cost of finding it and bringing it to the surface.

Four brand new fields came in that are below 15,000 ft — three in Louisiana and one in Oklahoma.

During the year 13 fields in Louisiana and Oklahoma for the first time began producing oil and/or gas from below 15,000 ft. Before this only 10 fields had produced from these great depths.

Records for both total depth and production depth were made by one well, the Richardson & Bass well in Lake Washington field, near the Louisiana coastline.

The costs are fantastic — Arabian Nights dreams of wealth. But not as amazing as the modern techniques and equipment that make "Sesame" a modern word to unlock treasures three or four miles deep.

Miss Adams is Management Editor.

TABLE 1. NUMBER OF WELLS DRILLED BELOW 15,000 FT AND BELOW BY YEARS OF COMPLETION

Year	Wells drilled below 15,000 ft by date of completion	Wild-cats	Average drilling time	Record drilling time	Average bits per well	Low bit record	Mud costs, average	Well costs, average	Average costs per ft	Total footage drilled	Deepest well	Deepest producer
1938	1	1	284		195					15,004	15,004	13,175
1945	4	4	490		222					63,480	16,655	13,175
1946	1	1	349		184					15,452	16,655	13,175
1947	8	8	267	121	181	73	$ 24,000	$570,000	$35 87	127,128	17,823	13,904
1948	7	6	328	113	303	99	28,000	551,000	34 34	112,329	17,823	14,255
1949	11	8	222	95	199	120	63,000	534,000	32 52	180,631	20,521	15,530
1950	5	2	235	150	181	106	63,000	577,000	36 72	78,565	20,521	15,530
1951	12	5	178	96	116	69	54,000	521,000	32 93	189,864	20,521	15,530
1952	25	17	212	83	138	44	66,000	542,000	34 14	396,850	20,521	16,102
1953	26	13	213	70	159	48	75,000	742,000	43 01	419,302	21,482*	17,895
1954	59	30	182	71	116	40	91,000	651,000	40 87	939,808	21,482	17,895
1955	100	70	147	37	86	44	115,000	644,000	40 06	1,607,437	22,559*	17,895
1956	150	71	150	36	88	31	113,000	667,000	41 76	2,411,250	22,559	20,745

*Not completed by end of year but record depth made.

What 150 Wells Cost

There were 150 wells drilled below 15,000 ft in 1956, exactly 50 percent more than in 1955.* The cost ran approximately $100,000,000 for these 150 deep wells averaging about $667,000 each, but the range was from about $200,000 to $2,550,000.

At the same rate of increase there will be 225 deep wells this year at a cost of $150,000,000.

There are indications, however, that the number of wells drilled 15,000 ft and below will be more than 225 and it is a reasonable guess that, although the total will be more, average deep-well costs may be less.

In some of the 23 fields where deep production has been found, prospects are attractive enough to call for more development wells than at any time in the past. Not since Weeks Island have prospects been so good. Development wells generally are less expensive to drill.

Many wells in this year's survey are offshore and that is where geologists have predicted deep production. The offshore drilling boom indicates more probing in depths than normal increase would bring.

Offshore drilling also brings the possibility of lower average cost, especially in development wells. Directional drilling from platforms lowers well cost drastically after one successful well. The $200,000-$300,000 range wells were offshore, drilled after the initial platform cost was charged to the first well.

Of course, as one man said, you have to find oil to realize the saving.

Table 1 shows the cost by years. Highest average was in 1953 when 11 of the 26 holes were drilled in Texas, including some West Texas wells on the high side. Total footage drilled was slightly higher, also, running 16,127 ft for the average hole below 15,000 ft. You'll also find in this table the average cost per foot for deep wells. This year is the second highest.

Production From Below 15,000 ft

The most interesting feature of this search of the depths is not that 150 wells went 15,000 ft and below, averaging more than 16,000 ft, or that the cost rose above $100,000,000 in 1956 alone, but that one of the four deep fields discovered was in Southwest Oklahoma.

The geologists have us conditioned to deep production near the coast and offshore and the Richardson & Bass deep well on the Louisiana coast has been substantial proof, but few were prepared for the big British-American-Ohio Oil condensate-gas discovery in Grady County, Oklahoma.

New Deep Fields

The biggest project completed in 1956 was, of course, the Richardson & Bass world record. It went to 22,570 ft and in May completed with perforations at 21,419-35 and 21,443-65 ft. In September a workover began and in January, 1957, it began producing from 20,741-45 ft, 260 b/d 37.8 gravity oil and 526 Mcf/d gas on a 8/64-in. choke.

It's a tremendous record and a herculean achievement. In itself it can never pay out, but the fact that it has been done opens a new depth horizon.

The first Oklahoma discovery below 15,000 ft, however, is on the way to paying for itself. The British-American No. 2 Harrison was completed in February, 1956, at 15,250-310 ft with 875 b/d condensate and 5500 Mcf/d gas and since then has produced at an average rate of 7000 Mcf/d.

The field crosses the Grady-Stevens County line about 30 miles southeast of Chickasha.

In early 1957 another B-A well, No. 1 Reed, found still deeper production in the Third Bromide sand at 15,575-635 ft so Oklahoma will have a new record this year.

A more complete account of this unique field will be published next month.

TABLE 2. LOCATION AND AVERAGES OF WELLS DRILLED 15,000 FT AND BELOW

State	Number wells 1956	Total 15,000 ft holes	Completed as Producers	Drilling time average days	Average bits per well	Deepest hole	Mud costs, average	Well costs, average
Alabama	0	2	0	225	186	15,729	—	—
California	2	32	7	190	168	21,482	$74,000	$653,000
Colorado	0	1	1	420	322	15,041	—	—
Florida	0	1	0	485	144	15,155	—	—
Louisiana	124	272	150	132	78	22,570	94,000	612,000
Mississippi	0	6	2	278	178	20,450	71,000	575,000
New Mexico	2	7	5	316	242	16,842	90,000	823,000
Oklahoma	3	10	4	394	279	18,158	92,000	790,000
Texas	17	72	28	219	158	19,060	108,000	661,000
Wyoming	2	6	1	352	218	20,521	79,000	905,000
TOTALS	150	409	198	169	109	22,570	94,000	638,000

*Because we completed our survey earlier than usual last year, most December wells were missing and are now included in that year. There is constant revision also because wells are sometimes deepened and reworked.

TABLE 3. FIELDS WITH PRODUCTION 15,000 FT AND BELOW

Field	County of Parish	State	No. wells that produced below 15,000 ft	Deepest production ft
North Coles Levee	Kern	California	1	17,895
Wasco	Kern	California	1	15,530
Wild Cat	Acadia	Louisiana	1	15,270
Deep Lake	Cameron	Louisiana	1	15,410
Avery Island	Iberia	Louisiana	1	15,496
Weeks Island	Iberia	Louisiana	24	17,745
Queen Bess Island	Jefferson	Louisiana	2	15,481
Lake Arthur	Jefferson Davis	Louisiana	1	15,784
Bay de Chene	Lafourche	Louisiana	1	15,235
Timbalier Bay	Lafourche	Louisiana	1	15,730
Lake Washington	Plaquemines	Louisiana	3	20,745
Venice	Plaquemines	Louisiana	1	15,860
Cade	St. Martin	Louisiana	1	15,085
Cote Blanche Island	St. Mary	Louisiana	4	16,415
Bayou Rambio	Terrebonne	Louisiana	2	15,034
Dog Lake	Terrebonne	Louisiana	1	15,573
Four Isle	Terrebonne	Louisiana	1	15,496
Lake Pelto	Terrebonne	Louisiana	2	16,084
Lapeyrouse	Terrebonne	Louisiana	1	15,035
San Simon	Lea	New Mexico	1	15,025
Carter-Knox	Grady	Oklahoma	1	15,310
Puckett-Ellenburger	Pecos	Texas	3	15,324
West Poison Spider	Natrona	Wyoming	2	16,102

The two other deep discoveries are both in South Louisiana.

Tidewater Oil Company No. 1 Rayne Lane Company found productive sand at 15,218-70 ft in Acadia Parish. Initial output was 182 b/d condensate and 3631 Mcf/d on 12/64 in. choke.

Sid Richardson Carbon Company No. 1 S. Fremin and J. S. Petro, Sr., Unit A in St. Martin Parish opened Cade field in August. Production on a 7/64-in. choke was 44 b/d condensate and 2322 Mcf/d gas from 15024-85 ft.

Another 10 deep wildcats going below 15,000 ft found new fields, three offshore.

The deepest of these is Eugene Island, Block 184, St. Mary Parish, where Phillips Petroleum made the discovery which produced 20 b/d condensate and 5205 Mcf/d gas from 14,808-36 ft.

Offshore of St. Mary is Humble Oil & Refining's Eugene Island, Block 77, discovery, which began at 132 b/d condensate and 5579 Mcf/d from 14,500-30 ft.

Magnolia Petroleum No. A-1 State lease 2726, offshore Plaquemines Parish, discovered 251 b/d condensate and 3440 Mcf/d at 14,291-305 ft.

Pan American Petroleum Corporation (Stanolind) discovered in West Bastian Bay, Plaquemines Parish, a new field at 14,508-18 ft. Its potential is 54 b/d condensate and 3532 Mcf/d gas.

Sid Richardson Carbon No. 1 Mrs. E. R. Boudreaux is the discovery well of South Rayne field, Acadia Parish. It produced 83 b/d condensate and 3012 Mcf/d gas from 13,936-43 ft.

Phillips Petroleum No. 1-A Christenson found Alta Loma field, Galveston County, Texas, which produced 643 b/d condensate and 7009 Mcf/d gas from 12,773-83 ft.

A dual completion was made at Union Oil of California No. 1 State Lease 2826, Terrebonne Parish, Louisiana, which is the discovery well of Caillou Island field. Production from 11,844-54 ft is 114 b/d 35 gravity oil and 56 Mcf/d gas and from 11,938-48 ft, is 160 b/d oil and 212 Mcf/d gas.

Only discovery in New Mexico by a wildcat going below 15,000 ft was Phillips Petroleum Leamex-Pennsylvanian discovery in Lea County. Total depth was 16,842 ft with production 11,316-52 ft. Initial output was 264 b/d 37 gravity oil and 280 Mcf/d gas on 3/8-in. choke.

Columbian Carbon Company No. 1 L. C. Desormeaux went to 15,561 ft in Acadia Parish, found gas at 12 to 13,000 ft but completed at 9739-45 for 31 b/d condensate and 700 Mcf/d gas.

Magnolia found 1182 Mcf/d gas at 13,944-14 and 14,168-940 ft for a new field at Val Verde County, Texas.

THANKS TO

DEEP WELL OPERATORS

AND

FIVE STAR OIL REPORT

this survey is possible. We have had virtually total cooperation in gathering the information collected here. Our sincere appreciation goes to these oil companies and this reporting servce.

New Sands Discovered

In spite of Dr. Frederick Lahee's good work at standardizing the terms "wildcat," "semi-wildcat," and "extension well," etc., not all companies follow the designations.

The 21 wells drilled below 15,000 ft that found new sands above that depth are usually called development wells by the operators, but it would be hard to find a more wildcat project than The Texas Company Bay de Chene well in Lafourche Parish that drilled to 17,211 ft and completed in a new sand at 15,220-35 ft for 228 b/d 40 gravity oil and 1160 Mcf/d gas.

At Lake Pelto field, Terrebonne Parish, Louisiana, Sun Oil found new sands with two deep wells. Its No. 2 State Lease 2620 is the deepest dual completion ever made. (See photo). From 16,074-84 ft initial production was 307 b/d 36.7 gravity oil and 1067 Mcf/d gas; from 15,738-63 ft it was 409 b/d 34.5 gravity oil and 466 Mcf/d gas.

Union Oil and Gas of Louisiana discovered new deep production at Lake Arthur, Jefferson Davis Parish, Louisiana. The 15,754-84 sand tested 232 b/d 41 gravity oil and 232 Mcf/d gas.

The Sun No. 1 State Lease 2620, Lake Pelto field, Terrebonne Parish, found production at 15,518-28 of 327 b/d 32.9 gravity oil and 520 Mcf/d gas.

The Texas Company has new oil sand at Lake Barre Unit 37-1, Terre-

TABLE 4. PRODUCING DEPTHS OF WELLS DRILLED 15,000 FT AND BELOW

Producing depth, ft	No. producers
2- 3,000	2
4- 5,000	1
5- 6,000	2
6- 7,000	3
7- 8,000	2
8- 9,000	8
9-10,000	6
10-11,000	9
11-12,000	16
12-13,000	21
13-14,000	35
14-15,000	32
15-16,000	40
16-17,000	10
17-18,000	10
20-21,000	1
TOTAL PRODUCERS	198

TABLE 5. DESCRIPTION OF WELLS IN THE UNITED STATES DRILLED 15,000 FT AND BELOW

TD, ft; Prod. depth	Company Well	Drilled by	Field, County or Parish	Completed; Spudded	Mud program	Perforations in prod. zones	IP, gravity, choke, T press.	Remarks
			CALIFORNIA					
16,336 Testing	Lloyd Corp. Lloyd Corp. 802	Drilling & Exploration	Ventura Ave. Ventura	6-18-56 11- 4-56				Field Well
17,485 D & A	Texas Co. Lawton #1		Fairview Canyon Ventura	1-13-57				FW.
			LOUISIANA					
15,000 D & A	Texas Co. Cont. Ld. & Fur Co. #4		Bayou Penchant	5- 9-56 7-26-56				FW.
15,000 D & A	Union Producing Boudreaux, et al #1	Delta Gulf Drilling Co.	N. W. Area Lafayette	1-12-56 4- 9-56				Wildcat
15,000 D & A	Union O & G of La. M. Wise #1	Nicklos Drilling Co.	WC. Vermilion	3-31-56 6-12-56	High pH emulsion			WC.
15,000 D & A	Tidewater Oil J. S. Abercrombie #1	Rowan Drilling Co.	WC. Plaquemines	4 -5-56 8-25-56	Nat. & red to 9000; lime treated oil emul. TD			WC.
15,000 9,784	Shell Oil Co. Peters #6	Co. Rig	So. Houma Terrebonne	11-28-55 3-22-56	Low pH red mud to 11,012, lime base oil emul. to TD	9773-9784	28 B, 1775 MCD /D 53.2°, 16/64", TB 3400	FW. Extended South Houma field.
15,000 D & A	Mecom & Freeport Vermilion Bay Ld. #1	Co. Rig	WC. Plaquemines	3- 8-56 6-28-56				WC.
15,000 13,470 10,842	Gulf Refining Co. La St 1772 #26		Timbalier Bay Lafourche	12-15-55 5-25-56		13,464-13,470 10,836-10,842	220-303 B, 210 MCF /D 37.1°-33.8°, 7/64"-9/64", TP 1250-1650	Dual producer in Timbalier Bay field.
15,004 11,770 10,952	Phillips Petroleum Eugene "A" #1-A (O C S L 0474	Loffland Bros	Eugene Isl. Blk 129 St. Mary	1-25-56 8-23-56	Salt water mud	11,760-11,770 10,946-10,952	240-342 B, 1349-520 MCF /D, 37.4°-39.6°, 16/64", TP 2450	Dual well, 2 tubing strings, 2 packers.
15,008 P & A	Magnolia Petroleum St Lse 762 #A-1 (OCS-056) Blk 55	Co. Rig	Ship Shoal, Blk 55 Terrebonne	2-13-56 8-31-56	Lime base			FW. Offshore
15,010 11,844 11,948	Union Oil Co of Calif. 1 St Lse 2826	Dixie Drilling Co.	Caillou Island Terrebonne	8- 5-56 12- 9-56	16.7# max. lime base	11,834-11,844 11,938-11,948	114 & 160 B, 56 & 212 MCF /D, 35°, 7/64"-16/64", TP 475-600	WC. Disc. new field. Miocene 64' thick gross.
15,015 D & A	Union Oil Co. of Calif. 1 St Lse 2649	Gracey-Hellums	WC. Terrebonne	2-15-56 7- 2-56	17.5# /Gal lime base			WC.
15,020 12,389	Sun Oil Co. Hebert #1	Co. Rig	So. Jennings Jefferson Davis	6- 5-56 10-28-56	Lime-treated Kembreak oil emul.	12,376-12,380	184 B, 2886 MCF /D, 47.9°, 7/64", TP 8400	FW. Side-track operations.
15,020 11,137	Humble Oil & Refining Co. H. L. Habetz, Jr. #1	Bullard Drilling Co.	Bayou Wickoff Acadia	10- 8-55 2-12-56	Lime base-CMC	11,125-11,137	303 B, 1092 MCF /D, 5/64", TP 3750.	FW. Disc. new sand. Frio.
15,025 (SDTK) 13,943	Sid Richardson Carbon Co. Mrs.E.R.Boudreaux #1	Dillard and Waltermire	S. Rayne Acadia	11-17-55 5-18-56	Red mud 5000-10,650; lime base to TD	13,936-13,943	83 B, 3012 MCF /D, 49.2°, 7/64", TP 9800	WC. Disc. So. Rayne field.
15,038 15,035	Placid Oil Co., et al LL & E Co. (2-B)	Doc Drilling Co.	Lapeyrouse Terrebonne	1- 1-56 3-23-56	High pH lime from 9814 to TD	15,025-15,035	82 B, 16/64", 6950	FW. Disc.
15,052 14,836	Phillips Petroleum Co. A-1 Eugene OCS-0472	Co. Rig	Eugene Isl. Blk 184	8-17-55 3-16-56	Fresh water sweet & lime base	14,808-14,836	20 B, 5295 MCF /D, 48.2°, 16/64", TP 5205.	WC. Shut-in, Discovered new field. Offshore. St. Mary Parish.
15,062	Texas Co. State Rabbit Isl. #22		Iberia	5-27-56				FW. Gas distillate.
15,065 2,953	Humble Oil & Refining Co. LL & E Q-2	Co. Rig	Leesville Lafourche	7- 7-55 1-26-56	Lime base CMC	2,940-2,953	1600 (dry) MCF /D, 1/4", TP 1150	FW. Discovered new sand. Pliocene.
15,073 D & A	Texas Co. Miami Corp. Fee #7		N. Meadows Cameron	12-28-55 5- 2-56				WC.
15,081 D & A	Cities Service White Castle #1	Webster Drilling Co.	Bay Natchez Iberville	6-27-56 11- 5-56				WC
15,089 D & A	W. H. Hunt 1 LL & E Co.	Penrod Drilling Co.	WC. Lafourche	8-30-56 12- 8-56				WC.
15,117 11,950	Union O & G of La. 1 A. L. Begnaud #1	Grady Roper	Branch Acadia	2-24-56 7- 6-56	High pH oil emul.	11,942-11,950	41 B, 3200 MCF /D, 12/64", TP 6200	FW.
15,125 13,360	Texas Co. Lake Pelto Unit 5-10		Lake Pelto Terrebonne	3-24-56 8-25-56		13,342-13,360	113 B, 69.2° MCF /D, 31.0°, 500	FW.
15,193 12,921	Texas Co. St. Lse 356 & 1217-Bay De Chene #1	Brewster-Bartle	Bay De Chene Lafourche	8- 4-56 11-28-56		12,913-12,921	192 B, 4800 MCF /D, 14/64", 4300	FW.
15,200 D & A	Texas Co. 1 St Lse 2679		WC. St. Mary	2- 6-56 8-25-56				WC.
15,210 13,329	Sunray Mid-Cont. & Buffalo Oil W. W. Bruner #1	Falcon Seaboard	Duson Lafayette	4-29-56 10- 3-56	Lime base	13,320-13,329	1 B, 2000 MCF /D, 39°, 12/64", TP 8850	FW. Discovered new sand, Bolivana Mexicana.
15,232 13,820	Tidewater Oil A. A. Gilmore #1	Offshore Co.	Bastian Bay Lafayette	5-26-56 12- 2-56	Nat. to 9500', Lime-treated oil emul. to TD	13,814-13,820	406 B, 390 MCF /D, 30.5°, 16/64", TP 2200	Extended field 8500' west. Miocene 330' thick.
15,240 D & A	Drilling & Exploration Cowen #1		WC. Acadia	6-11-56 8-25-56				WC.
15,241 Aban.	Texas Co. St. Caillou Isl. 174		Caillou Isl. Terrebonne	8-11-56 12- 3-56				F.W. Temporarily abandoned.
15,246 D & A	Republic Nat'l. Gas St Lse 1519 #1	Glasscock Drilling	WC. Terrebonne	6-30-55 1- 9-56	Lime base oil emul. 18#/gal.			WC. Tested several horizons.

TABLE 5. DESCRIPTION OF WELLS IN THE UNITED STATES DRILLED 15,000 FT AND BELOW *(Continued)*

TD, ft; Prod. depth	Company Well	Drilled by	Field, County or Parish	Completed; Spudded	Mud program	Perforations in prod. zones	IP, gravity, choke, T press.	Remarks
			LOUISIANA (Continued)					
15,248 10,422 9,978	Continental Oil B-1 OCS-0128 (St Lse 948)	Rowan Drilling Co.	Grand Isl. Jefferson	7-25-56 11-30-56		10,412-22 9,956-78	256-299, 32.6-33°, $\frac{5}{64}$"-$\frac{15}{64}$", TP 1650-1620	WC. Found new sand.
15,252 10,739	Placid Oil Co. South Coast #1	Penrod Drilling Co.	Raceland Lafourche	11-23-56 3-17-56	High pH lime from 8810-TD	10,727 10,039	51.5 B, 1600 MCF/D, 54°, $\frac{13}{64}$", TP 2850	Field well FW.
15,260	Texas Co. Lake Barre Unit 37-1		Terrebonne	9-26-56				WC. Disc. Oil field.
15,264 13,287	Sunray Mid-Cont. & Buffalo Oil M. McConnell #5	Falcon Seaboard	Duson Lafayette	5-27-56 12-25-56	Lime base	13,274-13,287	18 B, 2600 MCF/D, $\frac{13}{64}$", TP 10,400	FW.
15,277 SDTK: 13,548	Richardson & Bass Co. John W. Mecom: Humble LL & E St Lse 2517 # 2	Co. Rig	Bay St. Elaine Terrebonne	4-23-56 10-10-56	Red mud 3000 to 13,100: w/10% Diesel oil to 13,560: calcium Surfactant to TD	13,538 13,548	133 B, 349 MCF/D, 34.4°, $\frac{5}{64}$", TP 2650	WC. Extended field.
15,299 P & A	Pan American Prod. A. L. Couret # 1	Wheless Drilling Co.	Anse La Butte Lafayette	10-25-55 3-12-56	Low pH oil emul. @ 9300', lime mud @ 10,000', 17.2# final.			FW.
15,344 D & A	Austral & H. L. Hawkins M. E. Macdonell 1-B	Nickles Drilling Co.	WC. Vermilion	4-13-56 9-12-56	Converted to lime base @8328			WC.
15,377 D & A	Placid Oil Co. Interstate White Gro. et al #1	Penrod Co.	Lapeyrouse Terrebonne	10- 6-56 12- 1-56				FW. Reworked
15,400 14,941	Union Producing Kelly et al #1	Loffland Bros	Bayou Rambio Terrebonne	2- 2-56 5-21-56		14,923 14,941	Potential: 51,000 MCF/D rock press. 5948#	FW.
15,401 D & A	Cities Service Prod. Co. St Lse 2595 #1	Delta Gulf	Fausse Pt. St. Martin	9-10-55 1- 6-56				FW.
15,408 14,518	Stanolind O & G Co. Buras Levee Dist. #1		West Bastian Bay Plaquemines	9-12-55 3-29-56		14,508-14,518	54 B, 3523 MCF/D, 52°, $\frac{13}{64}$", TP 1500	WC. Disc. W. Bastian Bay field Shut in.
15,432 D & A	Texas Co. Schwing Ltr & Shg. #2		E. Lake Mongoulois St. Martin	1-18-56 6-30-56				WC.
15,472 15,390	John Mecom-Freeport Sulphur Earnest Cockrell, Jr. #46		Lake Washington Plaquemines	12-19-56 12-12-55			480 B, 8 MCF/D, 44.7°, $\frac{1}{4}$"	FW. Extended field.
15,491 14,530	Humble O & R Fed OCS 0466, Blk 77 #1	American Tidelands	Eugene Isl. Blk 77,	11-12-55 5- 1-56	Lime-base CMC	14,500-14,530	132 B, 3579 MCF/D, 49.6°, $\frac{32}{64}$", TP 5250	WC. Disc. new field offshore, St. Mary's Parish. Miocene.
15,500 D & A	Shell Oil Co. Cont. Ld & Fur #1-C	Glasscock Drilling, Inc	Bayou Piquant Terrebonne	2-19-56 7- 1-56	17.5# Gal. lime mud at TD			WC. Considerable lost circulation.
15,500 D&A	John W. Mecom S. Shore Oil & Dev. #2	Co. Rig	WC. Terrebonne	4- 2-56 5- 7-56				WC.
15,500 14,772	Texas Co. City of New Orleans #18		Leeville Lafourche	6-29-56 12-12-56		14,706-14,772	478 MCF/D, 8-31 Ch.	Field Well.
15,523 12,741	Continental Oil Co. A-1 OCS 0175	Nickos Drilling Co.	Grand Isle Blk 43	5-27-56 10-28-56		12,731-12,741	75 B, 1287 MCF/D, 52.3°, $\frac{5}{64}$", TP 4605	WC. Discovered new sand offshore, Jefferson Parish.
15,526 13,978	Placid Oil Co. B-3 L1&E	Penrod Drilling Co.	Lapeyrouse Terrebonne	6-20-56 11-27-56	High pH lime mud from 9884 to TD	13,943-13,978	1500 MCF/D (est), 51.1°, $\frac{5}{64}$", TP 4850	Shut-in gas well
15,527 15,016 15,034	Superior Oil et al Harry Bourg #4	Co. Rig	Bayou Rambio Terrebonne	8- 7-56 11-10-56		15,010-15,016 15,034	180.61 B, 10,728 MCF/D, 46.4°, $\frac{32}{64}$", TP 4223	Field Well.
15,535 15,410	Union Producing Rockefeller St. Lse 2340 #6	Loffland Bros	Deep Lake Cameron	12-14-56 7-10-56		15,392-15,410	Potential 20,500 MCF/D Rock Press: 7670	Shut-in gas well in field.
15,555 P&A	Magnolia-OCS 044-Blk 89 #1-2	Co. Rig	Eugene Isl. Blk 110 Iberia	11-16-55 3-11-56	Salt saturated			Field Well. Junked. Offshore
15,539 15,496	Humble O&R Co. Petit Anse #40	Gulf Coast Drilling	Avery Isl.	4-22-56 9-26-56	Alkaline-Tannate with CMC	15,476-15,496	374 B, 7329 MCF/D, 39.1° $\frac{14}{64}$", TP 2500	Field Well. Disc. new sand. Discon.in
15,561 9,745	Columbian Carbon L. C. Desormeaux #1	Clegg & Hunt	WC. Acadia	6-16-56 10- 6-56		9,739-9,745	11,B,700 MCF/D, 63°, 10/64", TP 1825	WC. Discovered new field.
15,579 D&A	Humble 1 Unit 2 Bayou Wickoff	Co. Rig	Bayou Wick-off Acadia	6-10-56 10-12-56	Lime base-CMC			Field Well. Extended field.
15,585 12,840 12,350	Magnolia Petroleum Co. Lutcher "A" #4	Co. Rig	Second Bayou Cameron	6-26-56 12- 1-56	Lime base 9.0-10 to 4525, 10.0-13.0-12,993, 15.5-16.9 to TD	12,790-12,840 12,300-12,350	23.8-26.1 B, 2865-2529 MCF/D, 46.2°-46°, Adj. Ch. TP 5150	Drill pipe stuck at 15,544, freed by spotting oil
15,590 10,335	Pan American-Austral Oil Eddie Benoit, et al #3	H. L. Edwards Drilling Co.	So. Thornwell Jefferson	6-27-56 12-19-56	18.0# final mud wt, low pH oil emul. @ 9000', limed mud @ 10,200	10,315-10,335	72 B, 3600 MCF/D, 42.8°, $\frac{32}{64}$", TP 6475	Field Well. Discovered new sand (Anahuac).
15,625 11,756	Sunray Mid-Con't. Delma Hanks #1	Falcon-Seaboard	Ridge Lafayette	4-19-56 10-22-56	Lime base	11,748-11,756	37.8 B, 2000 MCF/D, 47°, $\frac{12}{64}$", TP 7800	Field Well. Disc. new sand. (Upper Camerina).
15,627 D&A	Texas Co. 24-B St Lse 334		Vermilion Bay Iberia	12- 7-55 5-22-56				FW.
15,640 14,784	Union O&G of La. A. D. Gueno, et al "B" #1	Grady Roper	Branch Acadia	8- 1-55 2- 4-56	High pH oil emul.	14,780-14,784	6 MCF/D, adj. ch.	New gas pay (shut-in). Preparing to P&A.
15,650 15,270	Tidewater Oil Rayne Lane #1	Falcon Seaboard	WC. Acadia	2-26-56 7-24-56	Red 7000-9500, Lime-Diesel 9500-TD	15,218-15,270	182 B, 3631 MCF/D, 50.3°, $\frac{32}{64}$", TP 8650	WC. Disc. new field. (Nodosavia "A" sand 91' thick).

TABLE 5. DESCRIPTION OF WELLS IN THE UNITED STATES DRILLED 15,000 FT AND BELOW *(Continued)*

TD, ft; Prod. depth	Company, Well	Drilled by	Field, County or Parish	Completed; Spudded	Mud program	Perforations in prod. zones	IP, gravity, choke, T. press.	Remarks
			LOUISIANA (Continued)					
15,670 10,102	Continental Oil Co. A-3 OCS 0133-St. Lse 953	Loffland Bros.	Grand Isle, Blk 47 Jefferson	5-24-56 11- 6-56		10,092-10,102	253 B, 32.7°, 5/64", TP 1550	FW. disc. new sand offshore.
15,707 D&A	Western Nat'l Gas Sabrier Sonnier #1	Nicklos Drilling Co.	WC, Vermilion	10-12-55 1-25-56	Lime base oil emul.			WC.
15,725 13,710	Monterey Oil St Lse 2476 #2	The Offshore Co.	Intracoastal Cit, Vermilion	11- 4-55 4- 3-56	Red lime w/diesel oil below 9000 (10#)	13,670-13,710	205 B, 3900 MCF/D, 47.5°, 11/64", TP 4325	FW. extended production 1/2 mile east.
15,761 15,496	Superior Oil Co. R.W. Buckley, et al #1	Co. Rig.	Four Isle Terrebonne	11-12-55 4-29-56		15,476-15,496	149 B, 45.0°, 28/64", TP 3340	FW. disc. new sand.
15,784 D&A	John W Mecom A-1 St Lse 748	Dixie Drilling Co.	WC, Terrebonne	4-21-56 8-11-56				WC.
15,910 14,610	Superior Oil Co. Rockefeller #3	Co. Rig	Constance Bay, Cameron	4-21-55 2-18-56		14,562-14,610	277 B, 6494 MCF/D, 47.6°, 15/64", TP 4050	FW.
15,922	Superior Oil Co. Harry Bourg #3	Co. Rig	Bayou Rambo Terrebonne	4-10-56 8- 6-56				FW. shut-in gas WO market.
15,940 P&A	Magnolia Petroleum Co. St Lse 681 #1-K	Co. Rig	Eugene Isl. Blk 110 Iberia	5- 8-56 11- 1-56	Saturated salt surfactant			FW.
15,960 D&A	Texas Co. St Lse 340 #82		W. Cote Blanche Bay St. Mary	12- 8-55 8- 7-56				FW.
16,000 D&A	Gulf Refining Co. Delta Sec Co. #88		Bayou Couba St. Charles	3- 4-56 6-29-56				FW.
16,004 D&A	J. Ray McDermott & Magnolia St Lse 767 #F-1	Offshore Drilling Co.	Ship Shoal Blk 72 Terrebonne	5- 2-56 9-19-56				FW. Offshore.
16,011 D&A	Lamar Hunt Trust St Lse 2648 #1	Penrod Drilling Co.	West Pelto Terrebonne	12-20-55 5-24-56				WC.
16,021 15,528	Sun Oil Co. St. Lse 2620 #1	Brewster-Bartle	Lake Pelto Terrebonne	9-22-55 3- 4-56	Lime treated Kembreak Oil emul.	15,518-15,528	327 B, 520 MCF/D, 32.9°, 5/64", TP 3900, CP 650	FW. Disc. new sand Miocene 10' thick.
16,068-15,730 14,876	Gulf Refining Co La St Lse 1772 #35	Rowan Drilling Co.	Timbalier Bay Lafourche	6- 5-56 10- 2-56		15,714-15,730 14,854-14,876	522-147 B, 34.8°-29.2°, 8/64"-16/64", TP 4685-1590	FW. Miocene.
16,073 P & A	Magnolia Petroleum St Lse 774 #1-B	Co. Rig	Ship Shoal Blk 107	4-20-56 9-23-56	Lime base			WC. Offshore, Terrebonne Parish.
16,097 14,700	Continental Oil Homeseeker E. Unit #6	Nicklos Drilling Co.	Rayne Acadia	7-28-55 1-19-56		14,636-14,700 14,522-14,600	87 B, 3900 MCF/D, 46.1°, 15/64", TP 9150	FW.
16,100 11,880	Pan American & Austral Oil La. State Rice Milling Co. #2	H. L. Edwards Co.	S. Thornwell Jefferson Davis	3-20-56 6-14-56	Low pH oil emul @ 8700, lined @ 10,150, 18.0# final wt.	11,870-11,880	76 B, 2481 MCF/D, 48.9°, 5/64", TP 7600	FW. Field, A Marg. Howe sand 110' thick.
16,169 D & A	Texas Co. St. Joseph's Bay Unit 1 #1		WC Lafourche	4-29-56 12-15-56				WC.
16,189 10,500 9,228	Continental Oil St Lse 953 #2-A	Loffland Bros	Grand Isle Blk 47 Jefferson	12-12-55 5-21-56		10,494-10,500 9,220-9,228	581-176 B, 89,400 MCF/D, 31.9°-31.5°, 11/64"-15/64", TP 1500-800	WC. New sand offshore.
16,212 D & A	Magnolia Petroleum St Lse 776 #1-C	Co. Rig	Ship Shoal Blk 113	4-20-56 9- 1-56	Lime base salt saturated			FW. Offshore, Terrebonne Parish.
16,215 D & A	Union of Calif. #1 LL & E Co. St Lse 2786	Gracey-Hellums	Four League Terrebonne	7-16-56 11- 6-56	Lime oil emul, 16.1#/Gal.			WC.
16,217 D & A	Magnolia Petroleum St Lse 779 #D-1	Co. Rig	Ship Shoal Blk 113 Terrebonne	5- 9-56 10-12-56	Lime base			FW.
16,218 D & A	J. W. Mecom & Free- port Sul. LL & E #2	Co. Rig	Lake Washington Plaquemines	6-22-55 1-11-56				FW.
16,237 11,742	Tidewater Oil Co. J. Guidry #1	Falcon-Seaboard	Gueydan Acadia	8-27-55 4-16-56	Red 7000-9500, lime diesel 9500-TD	11,736-11,742	4891 MCF/D, 44.9°, 15/64", 6323, TP	WC. Disc. new sand Heterostegina, 20' thick.
16,238 D & A	Superior Oil Harry Bourg #2	Co. Rig	WC, Terrebonne	12-19-55 4-4 -56				WC.
16,250 11,924	Sid Richardson Carbon Amerada, et al #1	Dillard & Waltermire	Abbeyville Vermilion	11-25-55 5- 4-56	Red 7960-11,380, lime base to TD	11,920-11,924	56 B, 1909 MCF/D, 50.4°, 7/64", TP 8400	WC. Disc. new sand.
16,287 15,784	Union O & G of La. J. E. Lanthier et al #1	Gordon Drilling	Lake Arthur Jefferson Davis	2-25-56 9- 6-56	High pH oil emul.	15,754-15,784	232 B, 232 MCF/D, 41°, 4/64", TP 7100	FW. Disc. new sand. Hackberry, 72' thick.
16,344 D & A	Texas Co. Bay Junes, State 275 18-I		Terrebonne	1- 4-56 5- 6-55				WC.
16,354	Magnolia Petroleum Herbert-Helms #1	Co. Rig	WC, Cameron	2-10-56 9-24-56	Lime base oil emul to calcium surfactant mud at 9200.			WC. Aban. in favor of 1-X hole.
16,360 16,084 15,763	Sun Oil Co. St Lse 2620 #2	Brewster-Bartle	Lake Pelto Terrebonne	3-14-56 8-18-56	Lime treated Kembreak Oil emul.	16,074-16,084 15,738-15,763	307-409 B, 1067-466 MCF/D, 36.7-34.5°, TP 5000-4200	FW. Deepest dual completion in world. Disc. new Miocene sand 50', 85' thick.
16,442 11,101	Stanolind O&G Co LL&E Co. #3		W. Bastian Plaquemines	6- 1-56 11-10-56		11,002-11,101	193 B, 40°, 18/64", TP 1200	FW.

TABLE 5. DESCRIPTION OF WELLS IN THE UNITED STATES DRILLED 15,000 FT AND BELOW *(Continued)*

TD, ft; Prod. depth	Company Well	Drilled by	Field, County or Parish	Completed; Spudded	Mud program	Perforations in prod. zones	IP, gravity, choke, T. press.	Remarks
			LOUISIANA (Continued)					
16,466	Shell #1 "Y" Sand Gas Unit 7	Co. Rig	Weeks Isl. Iberia	8-12-56 11-26-56	10 Sr. Gal lime mud at TD			FW. Pipe stuck. Fished 30 days. Temp. aban.
16,500 D&A	Texas Co. St. Lse 347 #2		WC St. Charles	12-17-55 5-21-56				WC.
16,500 TA	Texas Co. #17-1 Bay St. Elaine Unit		St. Elaine Terrebonne	6-16-56 10-22-56				FW. Temporarily aban.
16,500 D&A	Texas Co. #14 State-Atachafalaya Bay		Bells Isle St. Mary	3- 5-56 7-13-56				FW.
16,505 D&A	Texas Co. St Lse 2681-Hole 2 #1		WC St. Mary	8-24-55 2-28-56				WC.
16,506 D&A	Hunt Oil Co. et al St Lse 2815 #1	Penrod Drilling Co.	WC Terrebonne	3-1-56 11- 1-56				WC.
16,508 D&A	Humble O&R Co. Federal OCS 0426 #1	The Offshore Co.	Eugene Isl. Blk 77 St. Mary	2-16-56 6- 5-56	Lime base-CMC			FW.
16,516 11,950	Superior Oil Co. Bureau of Land mgt. OCS 0246 #1-C	Co. Rig	W. Cameron Blk 71 Cameron	6- 1-56 10-27-56		11,945-11,950	142 B, 7472 MCF/D, $^{5}/_{64}$", TP 5535.	FW. Offshore. Shut-in gas well.
16,535 (SDTK) D&A	Richardson & Bass & Meeson Humble LL&E St Lse 2517	John Meeson	Bay St. Elaine Terrebonne	4-10-55 1-20-56	Red 7100-8150, lime base 11,400, lime base, 10 percent oil TD			WC.
16,601 7,244	Texas Co. Dibert, Stark & Brown #51		Golden Meadow Lafourche	6-11-56 12-16-56		7,240-7,244	64 B, 34°, $^{5}/_{64}$", TP 450	FW.
16,606 15,024	Sid Richardson Carlton Fremin & Petro. Sr. Unit A #1	Co. Rig	Cade Field St. Martin	3-26-56 8-23-56	Native 6150; red 10,800; lime base 11,700; lime base, 10 °/₀ oil TD	15,024-15,034 15,054-15,059 15,076-15,085	44 B, 2322 MCF/D, 48.2°, $^{5}/_{64}$", TP 8500	WC. Disc. Well of Cade field.
16,708 14,305	Magnolia Petroleum St. Lse 2726 #A-1	Co. Rig	WC Plaquemines	3-16-56 11-18-56	10.3 to 18.1 at TD Calcium- Surfactant mud.	14,291-14,305	251 B, 3440 MCF/D, 39.0°, $^{5}/_{64}$", TP 9185	WC. Offshore. Disc. new field. Miocene 11' thick.
16,808 12,551 12,526	Pure Oil Co. St Lse 833 #1-F	Loffland Bros.	Eugene Isl	3-28-56 10- 9-56		12,478-12,526 12,526-12,551	20 MCF/D, $^{5}/_{64}$", TP 6580.	FW. Offshore. Disc. New sand.
16,990 14,863 14,977 14,977	Superior Oil Co. Rockefeller St. Lse 2039 #5	Co. Rig	Constance Bayou Cameron	3-15-56 10-29-56		14,855-14,863 14,957-14,977	456.91 B, 6905 MCF/D, 49.1°, $^{5}/_{64}$", TP 4000.	FW. Dual completion.
17,000	Phillips Petroleum Thompson #1-D	C.J. Foster Drilling Co.	Crowley Acadia	11- 9-55 6- 5-56	Oil emul, 17.8 # at completion			FW.
17,000 D&A	Max Pray St. Lse 759 "A" #1	Dixie Drilling Co.	WC Terrebonne	10-24-55 3-14-56				WC. Offshore.
17,000 9,932	Gulf Refining Co. Jeanne Henderson et al #4		West Bay Plaquemines	6-18-55 2-11-56		9,922-9,932	454 B, $^{5}/_{64}$", TP 2480	FW. Miocene sand 8' thick.
17,004 15,860	Tidewater Oil Co. Manhattan Ld. & Fruit #28-A	Rowan Drilling Co.	Venice Plaquemines	11-15-55 4-21-56	Natural red to 9500' lime oil emul. to TD	15,815-15,860	184 B, 1593 MCF/D, 44.5°, $^{5}/_{64}$", TP 3500.	FW. Miocene sand, 300' thick.
17,049 D & A	Texas Co. Dog Lake Unit #21		Dog Lake Terrebonne	12-23-55 5-11-56				FW.
17,112 P & A	Pan American & Austral Oil Benoit #2	H. L. Edwards Co.	S. Thornwell Jefferson Davis	9-29-55 3- 3-56	Low pH oil emul. 9000', lime 10,150, 18.0# final wt.			FW.
17,211 15,235	Texas Co. St Lse 357 & 1217 #1-C		Bay de Chene Lafourche	12-16-56 8- 3-56		15,220-15,235	228 B, 1160 MCF/D, 40°, $^{5}/_{64}$", TP 7500.	FW. Disc. new sand.
17,285 16,110	Texas Co. 106 St Lse 301 Terrebonne Bay		Caillou Isl. Terrebonne	2-15-56 9-22-56				FW. Temporarily aban.
17,452 D & A	Texas Co. St Lse 1021 #1		Caillou Isl. Terrebonne	7-23-56 11- 2-56				FW. Offshore.
17,500 D & A	Shell Oil Co. Caffery et al #1	Co. Rig	Cote Blanche Isl. St. Mary	6-10-56 12-13-56	16.3# red-oil-emul. mud at TD			FW. Considerable lost circulation.
17,550 14,190	Placid & Stanolind St Lse 2857 #1	Penrod Drilling Co.	Caillou Isl. Terrebonne	4-22-56 9- 3-56	High pH lime mud from 8576 to TD	14,170-14,190	151 B, 1332 MCF/D, 42.8°, $^{5}/_{64}$", TP 4050	FW. Miocene producer.
17,711 D & A	Shell Oil Co. J. A. Smith #1-E	Co. Rig	Weeks Isl. Iberia	4-17-56 8- 6-56	16.6# lime oil-emul at TD			FW. Salt water flow at TD.
18,265 Temp A	Shell Oil Co. Caffery, et al 3-A	Co. Rig	Cote Blanche Isl St. Mary	10- 9-56 5- 4-56	17.0 lime-oil emul at TD			FW. Temporarily Aban.
22,570 21,435 21,465	Richardson & Bass (La. Acct.) LL & E-Humble-St Lse 2414 #1-L	Co. Rig	Lake Washington Plaquemines	2-27-55 5- 5-56	Red mud 6000-13,650, lime-base w /10°/₀ oil TD, calcium surfactant during completion.	21,419-21,435 21,443-21,465	140 B, 167 MCF/D, 43.0°, $^{5}/_{64}$", TP 1300, CP 1775	WC. World's deepest well. World's deepest producing well. Recompleted at 20,741-45 for 260 b/d & 526 MCF/D.

TABLE 5. DESCRIPTION OF WELLS IN THE UNITED STATES DRILLED 15,000 FT AND BELOW *(Continued)*

TD, ft Prod. depth	Company Well	Drilled by	Field, County or Parish	Completed; Spudded	Mud program	Perforations in prod. zones	IP, gravity, choke, T. press.	Remarks
			NEW MEXICO					
16,396 D & A	Phillips Petroleum Etz No. 1	Big Chief Drilling Co.	WC, Lea	10-25-55 7-6-56	Low solids Driscose emulsion			WC
16,842 11,352	Phillips Petroleum Leamex #6	Co. Rig	Leamex Penn, Lea	3-8-56 11-2-56	Low solids Driscose emulsion	11,316-11,352	264 B, 280 MCF/D, 37°, 8/64", TP 150	WC Disc. field Pennsylvanian, 36' thick
			OKLAHOMA					
15,310 15,310	British American Harrison #2	Big Chief	Carter-Knox Grady	6-14-55 2-14-56	BH wt. 13.1, vis. 120, WL 3, pH 8, gel 0-10	15,250-15,310	875 B, 5500 MCF/D, 55°	WC. Disc. field. Third Bromide.
16,962 D & A	Frankfort Oil Co. Blackbear #1	Parker Drilling Co.	SW Cement Caddo	7-27-55 8-16-56	Oil emul. (10%)			WC
18,158 P & A	Frankfort Oil Co. Pruitt #1	Parker Drilling Co.	W. Chickasha Grady	6-18-55 8-18-56	Oil emul. (10%)	17,300-17,382	6900 MCF/D	WC. Not commercial production.
			TEXAS					
15,000 D & A	Texas Co. J. J. Mayes Est #2		WC, Liberty	6-7-56 9-21-56				WC
15,000 12,838	Phillips Petroleum Houston "Z" #1	Foster Drilling Co.	Chocolate Bay, Brazoria	10-19-55 5-1-56	Driscose base oil emul.	12,829-12,838	106.4 B, 3509 MCF/D, 48.3°, 3/64", TP 8370.	FW. Extended field. Deep Frio 9' thick
15,143 14,062 14,940	Magnolia Petroleum Morrison #1	Co. Rig	WC, Val Verde	3-28-55 3-24-56	Gel and chemical mud	13,944-14,062 14,168-14,940	1,182 MCF/D, 28/64", TP 410-375, CP 442-401	WC. New gas field. Ellenberger, 118' thick
15,503 12,783	Phillips Petroleum Christenson #1-A	Foster Drilling Co.	Alta Loma Galveston	9-11-55 4-10-56	Driscose base-oil emul.	12,773-12,782	643 B, 7009 MCF/D, 50.6°, 24/64", TP 8122.	WC. Disc. New field. Deep Frio, 10' thick.
15,673 D & A	Stanolind O & G Wayne West #1	Hewgley Drilling Co.	WC, Val Verde	12-12-55 10-30-56				WC.
15,825 D & A	Sid Richardson Carbon S. M. Kyle et al #1	J. R. Sharp	WC, Loving	10-10-55 3-26-56				WC.
16,000 P & A	Hunt Oil Co. Elsinore Royalty Co. #51	Penrod Drilling Co.	Pecos	4-2-56 12-4-56				FW.
16,040 D & A	Magnolia Petroleum Janie Hawkins #2	Co. Rig	Sanborn Area Matagorda	11-8-55 5-29-56	Low lime base mud 17.2#			FW.
16,100	Shell Oil Co. A. V. Traylor "B" #1		Provident City Lavaca	9-10-56		8,641-8,660 8,626-8,636	12,500 MCF/D, 53°, Open flow, SIP 2321	WC. New sand.
16,196 D & A	Gulf Oil Corp. R. H. Price #1	Gardner Bros.	WC, Pecos	9-26-55 8-2-56	Salt & fresh water mud. Visc. 40 to 70.			WC.
16,684	Western Natural Gas Co. C. Cavazos #5	Well Drillers Inc.	San Salvador Hidalgo	1-1-56 12-1-56	Lime base oil emul.			WC.
17,000	Stanolind O & G University "CS" #1		Univ. Lands 27-23 Pecos					WC.
17,020 D & A	Shell Oil -Continental Federal Blk A-72 #1	Glasscock Drilling Co.	Gulf of Mexico Jefferson	8-18-56 10-19-56				WC. Offshore.
17,166 D & A	Magnolia Petroleum Gilbert Kerlin #1	Co. Rig	WC, Cameron	9-2-55 5-2-56	Lime treated-oil emul.			WC.
17,252 D & A	Hunt & Gulf Elsinore Royalty #48	Penrod Drilling	WC, Pecos	7-11-55 3-26-56				WC.
17,444 Shut-In	John W. Mecom Maco Stewart "B" #1		WC, Galveston	2-28-56 9-15-56				WC. Shut-In.
18,008 11,404	Phillips Petroleum Houston "M" #2	Co. Rig	Chocolate Bay, Brazoria	4-5-56 9-5-56	Driscose base-oil emul.	11,396-11,404	31.6 B, 1885 MCF/D, 54.0°, 20/64", TP 1940	WC. Extended field. Deep Frio 7' thick
18,771	Gulf Oil Corp. P. G. Northrup #1		Reeves					
			WYOMING					
15,050 D & A	Phillips Petroleum Co. Boysen #1	Co. Rig	WC, Fremont	4-17-55 3-7-56	Hi vis. Driscose low solids			WC
16,531 D & A	Phillips Petroleum Sublette #1	Mountain States & Signal	WC, Sublette	12-25-54 4-4-56	Gel, Driscose and weight material			WC

TABLE 6. OPERATORS* OF WELLS DRILLED 15,000 FT AND BELOW

Company	Wells drilled 1956	Wells drilled before 1956	Total
Abercrombie J. S.	0	1	1
Austral Oil Exploration	1	1	2
Brazos Oil & Gas Co.	0	1	1
British American	1	1	2
Brown, J. W.	0	1	1
Cities Service Producing	2	1	3
Columbian Carbon	1	0	1
Continental Oil Co.	5	5	10
Denver Product & Ref.	0	1	1
Drilling & Exploration	1	0	1
Flaitz, J. M.	0	1	1
Frankfort Oil Co.	2	0	2
General Petroleum	0	2	2
Gulf Oil Corp.	6	13	19
Hawkins, H. L.	0	1	1
Houston Oil	0	1	1
Howell, Holloway & Howell	0	1	1
Humble Oil & Ref.	6	18	24
Hunt Oil Co.	5	1	6
Husky Oil	0	1	1
LaGloria Corp.	0	1	1
Lamson, Bennett Cole	0	1	1
Lion Oil Co.	0	1	1
Little Mick Oil Co.	0	1	1
Lloyd Corp.	1	2	3
McDermott, J. Ray	1	1	2
Magnolia Pet. Co.	12	12	24
Mayfield, M. L.	0	1	1
Mecom, John W.	6	9	15
Monterey Oil Co.	1	0	1
Mountain Fuel Supply	0	1	1
Ohio Oil Co.	0	1	1
Owen, J. P.	0	1	1
Pan American Pet. (Stanolind)	4	12	16
Pan American Prod.	4	3	7
Pacific Western	0	1	1
Pasotex Petroleum	0	1	1
Phillips Petroleum	10	17	27
Placid Oil Co.	5	3	8
Pray, Max	1	1	2
Pure Oil Co.	1	3	4
Quintana	0	1	1
Republic Natural Gas	1	0	1
Richardson & Bass	3	14	17
Richardson, Sid, Carbon Co.	4	0	4
Richfield Oil	0	3	3
Shell Oil Co.	9	28	37
Standard of Calif.	0	11	11
Standard of Texas	0	1	1
Sun Oil Co.	3	5	8
Sunray Mid-Continent	3	2	5
Superior Oil Co.	7	16	23
Texas Co.	26	45	71
Texas Gulf	0	1	1
Tidewater Oil	6	2	8
Union of Calif.	3	1	4
Union Oil & Gas of La.	4	2	6
Union Producing Co.	3	2	5
Vasen, George	0	1	1
Western Natural Gas	2	0	2
Totals	150	259	409

*In partnership operation first operator named is credited.

bonne Parish, Louisiana, after going to 15,260 ft.

Humble Oil and Refining No. 40 Petit Anse discovered a new sand in Avery Island field, Iberia Parish. Production of 374 b/d 39.1 gravity oil and 7329 Mcf/d gas comes from 15,476-96 ft.

Superior Oil discovered below 15,000-ft productive sand in Four Isle field, Terrebonne Parish. Initial production from 15,476-96 ft was 149 b/d 45.0 gravity oil.

A sand at 15,025-35 ft produces 82 b/d oil in Lapeyrouse field, Terrebonne Parish, for Placid Oil Company.

Four deep wells of Continental Oil found new sands offshore of Jefferson Parish in Grand Isle field. Sunray Mid-Continent discovered new production in Duson and Ridge fields, Lafayette Parish. Humble reached new pay in Leeville, Lafourche Parish and in Bayou Wickoff, Acadia Parish.

Pan American Producing and Austral Exploration, Superior, Tidewater, Sid Richardson Carbon, and Pure Oil each discovered new production in Louisiana fields with deep wells. The best of these was Superior's 16,990 ft well in Constance Bayou. After dual completion at 14,855-63 and 14,957-77 ft, it tested 457 b/d condensate and 6005 Mcf/d gas.

Field Extensions

Three of the 10 deep wells that extended existing fields in 1956 are in Texas, the others in Louisiana.

Phillips made two extensions to Chocolate Bayou field, Brazoria County, Texas, going to a total depth of 18,008 ft with one.

Pan American Producing-Austral, John W. Mecom and Freeport Sulphur, Shell, Magnolia, Monterey, Richardson & Bass, and Tidewater each drilled a well below 15,000 ft that extended a Louisiana field.

Shut-In Gas Wells

There are seven deep wells that have discovered gas production, some in new fields or new sands but all are shut-in awaiting markets.

Two of these have heavy production. Union Producing's Deep Lake (Cameron Parish) well has an open-flow potential of 20,500 Mcf/d gas from 15,392-410 ft.

TABLE 7. DRILLING CONTRACTORS ON WELLS 15,000 FT AND BELOW

American Tidelands, Inc.
New Orleans, La.

Bell & Burden, Inc.
Los Angeles, Calif.

Big Chief Drilling Co.
Oklahoma City, Okla.

Brewster-Bartle
Houston, Tex.

Brinkerhoff Drilling Co.
Denver, Colo.

Bullard Drilling Co., Inc.
Houston, Tex.

Lyle Cashion, Inc.
Jackson, Miss.

Clegg and Hunt
Houston, Tex.

Crescent Drilling Co.
Monroe, La.

Delta Drilling Co.
Tyler, Tex.

Delta Gulf Drilling Co.
Tyler, Tex.

Dillard-Waltermire, Inc.
Wichita Falls, Tex.

Dixie Drilling Co., Inc.
Dallas, Tex.

Drilling & Exploration, Inc.
Los Angeles, Calif.

Harry L. Edwards Drilling Co.
Houston, Tex.

Falcon Seaboard
Lafayette, La.

G. J. Foster Drilling Co.
Richmond, Tex.

Gardner Bros. Drilling Co.
Dallas, Tex.

Gilger Drilling Co., Ltd.
Houston, Tex.

C. G. Glasscock Drilling Co.
Corpus Christi, Tex.

Gordon Drilling Co.
Lake Charles, La.

Gracey-Hellums Corp.
Houston, Tex.

Grady Roper
Lake Charles, La.

Gulf Coast Drill. & Exp. Co.
New Orleans, La.

Hilburn Drilling Co.
Dallas, Tex.

Howell & Howell
Dallas, Tex.

Kerr-McGee
Oklahoma City, Okla.

K. L. Kellogg Drilling Co.
Compton, Calif.

Loffland Bros Co.
Tulsa, Okla.

John W. Mecom
Houston, Tex.

Mountain States Drilling Co.
Denver, Colo.

Nicklos Drilling Co.
Houston, Tex.

Noble Drilling Corp.
Tulsa, Okla.

Offshore Drilling Co.
Baton Rouge, La.

Olson Drilling Co.
Midland, Tex.

Owen Drilling Co.
Overton, Tex.

Parker Drilling Co.
Tulsa, Okla.

Penrod Drilling Co.
Shreveport, La.

Thomas P. Pike Drilling Co.
Los Angeles, Calif.

Prince Drilling Co., Inc.
Houston, Tex.

Richardson & Bass
Fort Worth, Tex.

Rocky Mountain Drilling Co.
Los Angeles, Calif.

Rowan Drilling Co., Inc.
Fort Worth, Tex.

J. R. Sharp
Midland, Tex.

Signal Drilling Co.
Casper, Wyo.

Southeastern Drilling Corp.
Dallas, Tex.

Steen Drilling Co.
Houston, Tex.

Sun Drilling Co.
Los Angeles, Calif.

Trinity Drilling Co.
Dallas, Tex.

Tri-States Drilling Co.
Laurel, Miss.

C. B. Webster Drilling Co.
Houston, Tex.

Well Drillers, Inc.
Houston, Tex.

Western Service Drilling Co.
Longview, Tex.

Wheless Drilling Co.
Shreveport, La.

Marshall R. Young
Fort Worth, Tex.

Zephyr Drilling Corp.
Tulsa, Okla.

Superior Oil No. 1-C Bureau of Land Management OCS 0246 tested 142 b/d condensate and 7472 Mcf/d gas with 22/64-in. choke. This is offshore of Cameron Parish, Louisiana.

Successful Field Wells

Of the 19 deep development wells that were successful in 1956 all were in Louisiana fields and three brought production below 15,000 ft to the fields.

Gulf Refining Company made a dual completion of its Timbalier Bay field well in Lafourche Parish. From 15,714-30 ft its initial production was 522 b/d 34.8 gravity oil and from 14,854-76 ft 147 b/d 29.2 gravity oil.

Tidewater's 17,004-ft well in Venice field, Plaquemines Parish, produced 184 b/d 44.5 gravity oil and 1595 Mcf/d gas from 15,815-60 ft.

Bayou Rambio field, Terrebonne Parish, has deeper production with Superior's well, which tested 181 b/d 46.4 gravity oil and 10,728 Mcf/d gas with 22/64-in. choke from 15,010-16 and 15,025-34 ft.

New Depth Records

Besides the new depth record of 22,570 ft for Louisiana, two other states set up new records.

A record depth of 18,158 was made in Oklahoma by Frankfort Oil No. 1 Pruitt. This well had a good gas show at 17,382 ft.

In New Mexico Phillips Petroleum No. 6 Leamex hit a new depth at 16,842 ft in Lea County. The well has good production from 11,316-52 ft but this is not the deepest in the state.

The year before Magnolia's West Ranch "A" 417 set up the depth record for Texas at 19,060 ft. It was discovery well of a shallow field.

Drilling Time

Average time for drilling, which has a downward trend, went up slightly this year — to 150 days. Three deep wells in Oklahoma and two in Wyoming, and two in New Mexico areas, which require more drilling time and the record deep well had something to do with this.

Last year average drilling time fell to 127 days, the lowest so far.

A more definite pattern can be seen in the lowest drilling time by years. It is hard to drill a 15,000-ft well in 36 days, which John W. Mecom did on his own wildcat in Terrebonne Parish, Louisiana. Total depth was 15,500 and the hole was dry.

In 1955 Penrod Drilling went to 15,177 ft in 37 days on a Placid Oil Company Lake Washington field well.

Since 1950, records have been made each year on drilling time for deep holes, an encouraging trend.

Louisiana has reduced its average drilling time from 135 days in 1955 to 132 days in 1956. Other state averages show similar reductions, but they all have much higher drilling time than Louisiana. Drilling time by state includes all years (Table 2).

Drilling Bits

Improvement continues also in drilling bits. Average of 88 per well went up slightly from 86 last year but this could be attributed to the greater average depth per well of about 170 ft. At the bottom of three miles of tubing, this is a significant figure.

Low bit records have shown improvement usually. The well that required only 31 bits in 1956 was Magnolia's Eugene Island field well offshore Iberia Parish. It was drilled by company tools to 15,539 before being plugged and abandoned.

Mud Programs

Mud programs are highly important to successful deep drilling. Many mud programs for individual wells are found in Table 5.

There is considerable variety indicated by the programs given. If you remember, however, there was the same variation in casing programs when this survey of deep wells began 11 years ago. Now casing programs have become virtually standardized and for the first time they are not carried in Table 5.

Cost of mud programs, like well costs, have a wide range. You may get by for $30,000; you may pay 20 times that much.

Average cost of the mud program has gone up each year since 1951. This year it went over $115,000 per well. With some of the pressures in deep wells, the mud program can easily determine whether the well is successfully completed.

Producing Depths

Table 4 gives interesting data on production depths of deep wells. Of the 409 holes 15,000 ft and below drilled in the United States, 198 were completed as producers.

Most of these — 107 wells — are producing between 13,000 and 16,000 ft. Ten wells reached production between 16,000 and 17,000 ft and 10 between 17,000 and 18,000 ft.

Only 24 or 12 percent of the 198 produced above 10,000 ft.

It is of interest, too, that 48 percent of all deep wells are completed to produce oil and/or gas.

Operators and Contractors

Just the fact that there are 60 different companies that have drilled at least one well 15,000 ft or below gives some idea to the size of the drilling industry. (Table 6.)

Of these, 28 operators have drilled only one deep hole each but even one is a major project.

The Texas Company has drilled more deep wells than any other company — 26 in 1956 and a total of 71 holes 15,000 ft or below.

Ten or more deep operations have been completed by Shell, Phillips, Magnolia, Superior, Humble, Gulf, Pan American Petroleum (Stanolind), Standard of California, and Continental Oil Company.

This year 10 operators entered the lists for the first time.

Another impressive figure is that 55 drilling contractors have rigs and crews who have drilled below 15,000 ft. Table 7 lists these.

Future Deep Drilling

Geologists see no reason why we shouldn't find oil at 40,000 or 80,000 ft but there will have to be some great improvements first.

Terrific pressures are a big problem. Tidewater's well at Manila Village, Jefferson Parish, has the highest pressure in our records for a completed producing well. In 1949 it found a new field at 13,007 ft and was completed in spite of pressures estimated at 12,600 psi.

In his article "How Deep Can We Go?"* C. E. Reistle, Jr., vice president and director of Humble Oil and Refining, states:

"The prime stumbling block in the way of deeper drilling in the future, then, would seem to be one of money. If the geologists believe there is oil at greater depths, and they do; if manufacturers and design engineers feel they can master the technical and mechanical problems, and they're making steady progress; then a major consideration is whether or not the economics of such deep drilling would justify the enormous investments necessary to drill the deeper wells."

At least 1956 results give new evidence that there is production and that some deep fields will be a profitable operation. This fact will influence deep drilling programs in spite of the large investments required.

Another point in drilling economics should also be faced. If exploration, leasing, drilling and completion costs from 1859 to 1957 were totalled and balanced against crude oil sales for the same period, the industry would be in the red. Only future production can pay for present drilling. So long as the possibility exists of finding oil and gas reserves on the depth frontier there will be operators to drill for them. ★ ★ ★

*Humble Way, Nov.-Dec. 1956.

Some up-to-date thinking on . . .

How Straight Does a Hole Need to Be

Liberalized hole deviation may be our next big step in reducing drilling costs. Here's what Atlantic Refining Company engineers and lawyers have to say about it

What the Drilling Engineer Says . . .

Hugh Faulk,
Development Drilling Engineer,
The Atlantic Refining Company, Dallas, Texas.

THE drilling branch of the producing industry is primarily interested in drilling functional wells at minimum costs. It is well known that all the cost of drilling must be borne by the operator. So, it is logical to ask "What does it cost to drill wells with various limitations on hole deviation?" The answer to this question is somewhat uncertain for it depends upon many variables. Some of these are dip, thickness, and depth of geological formations to be penetrated, their drillability, equipment used in the operation, drilling practices, and hole evaluation methods.

Since responsible personnel must use judgment in arriving at hole deviation limitations, wide variations are encountered in practice. These now vary from 3 to about 10 deg. These requirements also vary with depth. Hole curvature (rate of change of angle with depth) limitations are also sometimes imposed and vary between one to three degrees per hundred feet of depth.

Cost of deviation control. Most rotary rigs average about one directional survey per day while operating. The contractor supplies the survey instrument and necessary rig time. An estimate of this cost may be based on one-third hour rig time per survey at $30 per hour and $1.50 per day survey instrument cost. With 2500 rigs operating, this cost is a little more than $10 million per year in the U. S. This is the cost of measuring the hole deviation so that control measures may be exercised if deemed necessary.

The largest fraction of deviation control cost results from measures used to straighten crooked holes or to hold deviations within contract limitations. These techniques frequently lead to reduced penetration rates or loss of hole due to plug back to straighten. The AAODC Crooked Hole Committee has been working to establish this cost and devise methods of minimizing it. This committee has tentatively estimated the possible savings, through more realistic contractural agreements between contractor and operator, at $40 million per year. More realistic contractural relations would substantially eliminate loss in efficiency due to the crooked hole problem. This estimate is based upon an overall loss of drilling efficiency due to hole deviation contract requirements of 10 percent in Southern Oklahoma, 10 percent in the West Texas-New Mexico area and 20 percent in the Rocky Mountain area. An estimate based upon an extrapolation of limited operator experience confirms the

From API Committee on Production Practices:

This subject was raised at the API Southwestern District Meeting in the Spring of 1956. It was presented to the Production Practice Committee by the Drilling Practice Committee and emanated from terminal recommendations of a District Study Committee on Straight Hole Drilling. This latter group has concluded it knew what to do to keep the hole straight but that the costs were high, and it was their thinking that re-evaluation of the need should be undertaken by the industry. On this basis the problem was referred to the District Production Practice Committee. As Chairman of this Committee, I have discussed the problem with many in the industry. It has been the consensus of these "sounded people" that something should be done but there has been little agreement as to "what."

In view of this need, the staff thinking of one major company was sought and is presented here as a symposium discussion. It is hoped that this effort to define the problem and re-evaluate the costs will stimulate others to attempt to answer this problem. The API Southwestern District Production Practice Committee stands ready to be the industry's tool for forum discussion and formulation of any course of action deemed advisable.

J. H. Sullivan, Chairman
Committee on Production Practices
Southwestern District
Term 1955-1956

U.S. operators pay more than $50 million annually for hole deviation control, not including wells directionally drilled intentionally.

AAODC figure. However, this would include up to 5 percent loss of drilling efficiency in some other areas of operation.

Another cost of hole deviation control results from the increased hazard of sticking the drill string while making deviation surveys. This hazard, although nominal in routine operations, becomes so high in some situations that operators stop the surveys. Still another cost of deviation control results from the increased hazard of fishing jobs and actual loss of holes from hole straightening methods. It is well known that the best way to keep out of trouble on a well is to drill it fast and get off of it. Any practice that reduces daily drilling efficiency increases the hazard. This factor, of course, is minor in some cases but is of critical importance in others. The cost of these hazards is uncertain but may be as great as $5 million per year.

All totalled, it is estimated that the industry now spends more than $50 million per year in the U. S. for hole deviation controls. This estimate excludes wells planned for directional drilling. This is equivalent to an overall loss of drilling efficiency in the U. S. of more than 5 percent. From a drilling point of view, it appears that this loss may be reduced to one percent (saving about $40 million per year) within the next several years. The present stakes are substantially smaller than they were a few years ago. Technological developments have allowed contractors in many situations to drill holes within contract limitations without reducing daily drilling efficiency. Operators, more aware of this cost, have liberalized hole deviation limitations to some extent in recent years.

Methods of deviation control. Contractor, operator and service company groups have combined in recent years to develop hole deviation technology. Holes deviate from vertical primarily because of inclined or dipping formations and lack of rigidity of the drill collar assembly. Most dog-legs (rapid changes in direction of hole deviation) are caused by sudden changes in formation dip. Dog-legs, however, may also result from changes in weight on bit, drill collar size or position of stabilizer(s).

Deviation control methods depend upon improving the columnar rigidity of the first two or three drill collars above the bit. An increase in the size of the drill collars increases the weight which may be used on the bit for a given hole deviation.

The same objective can be attained by use of a correctly positioned stabilizer, by reducing clearance between drill collars and the hole and by increasing both drill collar and hole sizes. The best use of these practices, however, may result in hole deviations of more than 10 or 15 deg in some cases if maximum drilling rates are maintained. Under these more severe crooked hole conditions the weight on the bit is usually reduced to control deviation.

Drilling costs increase, of course, as the weight on the bit is reduced. This is most important in hard and very hard rock drilling operations with steeply dipping formations. High unit bit weights are routinely used in hard rock drilling. These vary between about 4000 and 8000 lb per in. of bit diameter. When unit weight is reduced to a fraction of normal, then daily drilling progress is reduced to about the same degree. Most industry effort is directed at minimizing hole deviation while using high unit bit weights.

The Author

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Deviation control practices. Deviation control requirements are somewhat uncertain. Some principles of control can be enumerated, however, if the legal and production limitations are ignored and only the drilling viewpoint is considered. Also to be ignored are wells planned for directional drilling to a previously established "target area." Here we are considering "straight up" wells.

Objective is to drill functional wells at minimum cost to some prescribed geological horizon. Above ground drilling equipment can be chosen for operational and cost economy.

Technological developments and experience can be used to establish the variation of drilling rate and hole deviation with different drilling practices. This experience would be developed while drilling the first well (or few wells) on a structure.

Drilling practices that must be used may lead to reduced drilling rates in order to meet the contractural deviation limitations. It may be that unit bit weight must be reduced to 30 or 50 percent of normal in drilling much of the hole. The operator at this point is faced with several alternatives.

(1) He can require drilling with reduced bit weight, as much of the industry is now doing, while maintaining a three or five degree limitation. Daily drilling progress under these conditions may be reduced more than 50 percent of that attainable with a liberalized deviation limitation.

(2) The operator may also liberalize the deviation requirement to 7, 10 or even 15 deg and regain much or all of the lost drilling efficiency. In doing this, it will be necessary to plan and in some cases move the surface location so that the bottom of the hole will be correctly positioned on structure.

(3) Another device helpful in some situations will be to increase the size of casing(s), hole(s), and drill collars. The increased rigidity of the larger drill collars higher unit bit weights to be used on the larger bits for a given deviation. The resultant greater penetration rate may be offset by the higher cost of casing and mud and the higher operating cost of the large rig needed, however.

Clearly, the alternative with the largest stakes in the liberalization of hole deviation. Look at the practicality of this solution from the drilling point of view. The hole must be kept operational; i.e., we must drill, evaluate the hole and set casing without high risk of sticking equipment in the hole. Experience suggests that this risk increases with dog-legs. The

Overall loss in U.S. drilling efficiency due to deviation control is about five percent . . . can be reduced to one percent.

Liberalized deviation programs have paid large dividends in reducing drilling costs in some areas.

greater the directional change, the greater the apparent hazard, usually due to keyseating. (Keyseating troubles are also related to time, dimensions of in-hole equipment, crew experience and hardness of formations.) A limitation on hole deviation does not solve this problem of rapid rate-of-change in deviation. For example, a hole could change from three degrees in one direction to the same deviation in the opposite direction, a six degree change, in a short interval. This would fulfill a three degree contract but might create a high keyseat hazard.

The industry has not yet devised a practical method to preclude rapid rate-of-change of hole deviation. Many contracts are written with limitations such as one, two or three degree angle change per 100 ft of depth. However, the high cost of surveys to check this while drilling ordinarily precludes enforcing the limitation.

Under most conditions an "approved" bottom hole drilling assembly gives the best assurance against this. "Approved" assemblies may be oversize drill collars with properly positioned stabilizer or several stabilizers on bottom-hole collars to obtain a packed-hole condition. Such an assembly ordinarily would be run in critical sections of the hole. Dipmeter surveys on near-by wells would be very beneficial in defining critical sections of the hole and in establishing the most desirable bottom-hole assembly.

Hazard from dog-legs and from semi-straight inclined sections of the hole cannot now be completely separated. Directional wells, some with deviations greater than 70 deg, offer the greatest experience to the industry in this field. This experience suggests that the risk of sticking equipment in the semi-straight inclined sections may be nominal. This appears true with inclinations of up to 15 deg when good operating practices are followed.

We also need to maximize daily drilling progress to minimize risk of sticking equipment due to time-deterioration of many holes. In all except hard rock operations there is a time limitation before trouble develops. Under these conditions, the risk increase from slowing drilling rate (to limit deviation) may be much greater than that from the greater hole deviation.

Routine straight hole measurements in areas where hole deviation may be substantial cannot be discontinued. There are two types of wells, however, where deviation measurements are not justified. One type is development wells in areas where deviation is not excessive regardless of drilling practices. The other is deep, hazardous wells where the necessary shut-down time for straight hole tests may lead to stuck drill string. It may be desirable for the operator to specify the bottom-hole drilling assembly used.

Industry trend to accepting greater hole deviations must certainly continue for some time. Liberalized deviation programs have paid large dividends in reducing drilling costs in some areas. Further experimentation will probably uncover new control methods. Also, the expected increased hazard cost has not yet materialized in this experimenting. Until a point is reached where greater hazard costs offset high drilling efficiency, there is insufficient justification from a drilling point of view to limit hole deviation on wells.

Bibliography

1. Moore, S. "Committee Reports," *Drill. Contr.*, (December, 1956) 89.
2. Lubinski, A., and Woods, H. B., "Factors Affecting the Angle of Inclination and Dog-legging in Rotary Bore Holes," API, *Drill. and Prod. Prac.*, (1953).
3. Lubinski, A., "A Study of the Buckling of Drill Collar Strings," API, *Drill. and Prod. Prac.* (1950) 178.
4. Wood, H. B., and Lubinski, A., "Practical Charts for Solving Problems on Hole Deviation," API, *Drill. and Prod. Prac.*, (1954).
5. Speer, J. W., and Holliday, G. H., "Crooked Holes — and How to Help Them Go Straight," *Oil and Gas Journ.*, August 1, 1955, August 8, 1955, and August 29, 1955.
6. Bromell, R. J., "Lick Those Crooked-Hole Problems," *Oil and Gas Journ.*, (November 8, 1954) 149.
7. Booth, W. M., and Angebrandt, F. M., "How Crooked Hole Problems Are Solved," *World Oil*, (August, 1954) 125.
8. Moore, S. C., and Brantley, M. M., "Classifying Drill Collars and Bottom Assemblies for Crooked Hole Studies," *World Oil*, (November, 1955) 134.
9. Norris, F., "Drilling a Crooked Hole Intentionally," *Oil and Gas Journal*, (June 4, 1956) 92.
10. Lubinski, A., and Blenkarn, K. A., "Usefulness of Dip Information in Drilling Crooked Formations," *Drill Contr.*, (April, 1956) 53.

What the Production Engineer Says . . .

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CONSIDERING the question, "How straight does a hole need to be?", the production man's answer has in the past been, "The straighter the better." From a very limited point of view his answer simply means, "With a straighter hole, I have less fear of the possibility of problems."

Is there something wrong with this answer? Yes, the incorrectness lies in the fact that the answer is too general. Often, based upon misinterpretations of the cause of production problems or as the results of poor practices, blame has been placed on hole deviation. Yet, performance todate indicates that successful and economical operations may be obtained in wells have a deviation in excess of 45 deg.

All things being equal, it would be preferable to operate in as straight a hole as possible. However, where there is a possibility of reducing the initial cost of the well through relaxation of deviation limits, the ability to produce economically must be considered. From the production man's point of view, the real problem is to carefully evaluate its disadvantages. What are they? Where do they lie? How much deviation can we stand before we get into trouble and encounter higher operating costs?

This discussion does not presume to answer all aspects of these ques-

. . . limitations on hole deviation could be substantially relaxed without creating significant problems which would increase operating costs.

. . . successful and economical operations may be obtained in wells having a deviation in excess of 45 deg.

tions. A great deal of cooperation will be required within the industry to develop and solve all the facets of the problem of producing wells with greater deviation.

The problem to the production man is both deviation and the rate of change of deviation. Extreme change of deviation is recognized as the well known "dog-leg." Even permissible limits of rate of change of deviation are not now well defined, however.

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Roy M. Willis is a senior production engineer for The Atlantic Refining Company in Dallas, Texas. Since joining the company in 1948, he has worked in production engineering in the field and office. Willis is a graduate of the University of Texas in mechanical engineering. He was promoted to his present position in 1952 and is presently active in committee work with the API. He is also a member of the AIME and has done considerable work in the field of artificial lift applications.

We believe that the permissible limits of the rate of deviation are variable since they are primarily dependent upon the type of well completion and artificial lift equipment that will be applied.

Production limitations on deviation. It can be reasoned that the sucker rod pumping method of artificial lift would impose greater limitations than any other producing operation. This is due to the fact that the bottom-hole pump is reciprocating from the surface by a continuous sucker rod string. Deviation from the vertical might therefore tend to increase rod and tubing wear and could possibly impose an excessive frictional drag on the system. It is commonly believed that a hole deviation of 5 to 10 deg from vertical causes severe wear. This, however, is questionable. Surveys conducted in a large number of California wells, inclined as much as 45 to 60 deg, indicate that production costs in these wells were either equivalent to or at the most 10 percent higher than operations in so-called "straight" holes.

Actually there is no such thing as a perfectly straight hole. There is always the normal tendency for the bore hole to deviate from the vertical. In some instances, this tendency is considerable and repeated attempts to straighten the hole may result in rather sharp reversals of deviation creating dog-legs. By allowing the regional drift to continue uncorrected, the resulting hole, though having greater deviation, would in many cases be better suited for rod pumping operations.

The rate of change of hole deviation (i.e., "dog-legs") as applied to rod pumping is probably more misunderstood than any other factor. Generally, a production man considers that any well having excessive rod and tubing wear is a crooked hole. However, surveys run on a few of these wells have indicated that the rate of hole deviation was no more than one or two degrees per 100 ft. On the other hand, there is sufficient evidence to indicate that directional wells with changes in deviation in the order of five degrees per 100 ft are giving no rod pumping wear troubles. This suggests that problems in many rod pumping wells in the past, which have had excessive rod and tubing wear resulting in high operating cost, may not have been due to hole deviation or change in deviation but rather to the phenomena of tubing buckling. Tubing buckling is not necessarily related to the straightness of a hole.

Hydraulic bottom-hole pumping systems and gas lift systems are both very well adapted for use in high deviation holes and holes with high rates of deviation. Since both systems are fluid actuated and do not require rods or other mechanical linkage, they operate successfully regardless of orientation. Their primary limitations in installation are the same as the tubing in or on which they are used. Therefore, it can be assumed that these artificial lift systems can be installed and satisfactorily operated in any well in which tubing strings can be properly run.

Running and pulling tubing. The question is, "How straight does a hole need to be satisfactorily run and pull a tubing string?" It is suggested that this can be accomplished in any hole that will permit a continuous full string of conventional casing to be run. This not only applies to a single string of tubing but is applicable to parallel tubing dual completions as well. Practice has shown that given proper clearances two strings can be run in casing as readily as the single string. In view of this, it is anticipated that dual completions as well as single completions would be feasible.

From the above, it is apparent that the permissible limits of hole deviation and its rate of change reduces at this time to one problem. This is the amount of deviation which can be tolerated in setting the casing string and obtaining a satisfactory cementing job. Based on past experience, it is believed that with gradual changes in deviation satisfactory casing operations can be obtained with the use of centralizers and other aids.

It is suggested that from a producing point of view the now applied limitations on hole deviation could be substantially relaxed without creating significant problems which would increase operating costs. When we consider that many hundreds of highly deviated directional wells are being satisfactorily and economically produced today, then it seems highly unnecessary from a producing standpoint to maintain rigid restriction of the hole deviation in so-called "straight hole" drilling.

In summary, the point is stressed that this discussion should not be construed to advocate crooked holes. Rather it is advocating that if there are large savings to be realized in drilling costs, then a considered program of relaxing hole deviation standards could be launched in a step-by-step manner to determine the practical limitations for good production practices.

Bibliography

1. Eastman, H. John, "*Producing Directional Drilled Wells*," Eastman Oil Well Survey Company, Denver, Colorado.

2. Lubinski, A., and Blenharn, K. A., "*Buckling of Tubing in Pumping Wells, Its Effect and Means for Controlling It*," AIME thirty-first annual fall meetings, Los Angeles, 1956.

Actually, there is no such thing as a perfectly straight hole.

What the Oil and Gas Lawyer Says . . .

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IT has been suggested that drilling costs can be reduced from 15 to as much as 40 percent in some areas by permitting hole deviations up to seven degrees.

The first observation that should be made and which is fundamental is that no deviation of a hole from the vertical should be made to the extent that the well bore crosses a property line and penetrates an adjoining tract of land. This constitutes a trespass, and the mineral owner of the land, on which is located the completion interval from which the well produces, is the owner of the oil and gas produced therefrom even though the surface location of the well may be on another tract of land.

The statutes in a few of the states, namely: Florida, Montana, Nevada, North Carolina, Washington, and Wyoming, expressly authorize the conservation agency to make rules and regulations governing directional surveys. While the conservation acts of other states do not give such specific authority to the conservation agency, it is believed that this right, nevertheless, exists in that agency and the agency of some of these states have promulgated rules and regulations with respect to the deviation of wells from the vertical.

Arkansas

Rule B-30 — Deviation Tests. At or before the time of filing the last casing test with the Commission's agent, each operator shall file in the form of a letter a signed record of deviation tests taken at five hundred (500) foot intervals. In order to prevent encroachments on or injury to neighboring leases or property, all wells drilled at a distance of less than one hundred fifty (150) feet from the nearest property line shall not deviate more than three (3) degrees from vertical at any point in the hole; all wells drilled at a distance of less than three hundred (300) feet and more than one hundred fifty (150) feet from the nearest property line shall not deviate more than four (4) degrees from vertical at any point in the hole; wells drilled at a distance of more than three hundred (300) feet from the nearest property line shall not deviate more than five (5) degrees from vertical at any point in the hole. The Commission shall have the right to make or require the operator to make a directional survey of the hole, at the request of the operator prior to the completion of the well; and the Commission shall have the right to make or to require the operator to make a directional survey of the hole at any time, and at the expense of the operator, in order to ascertain that the well has not deviated beyond the boundaries of property on which well is located.

Louisiana

Section XVIII — Directional Drilling and Well Surveys. No well shall be drilled in the State of Louisiana in which the well bore shall deviate laterally at any point a distance greater than that determined by a three (3) degree angle from a vertical line passing through the center of the surface location of the well bore; provided, however, that in the event the operator desires to whipstock or intentionally deflect said hole more than said three degrees from vertical, except to straighten the hole or to sidetrack junk in the hole or other mechanical difficulties, then and in that event, said operator shall first obtain a special permit from the District Manager to so deflect said hole and shall furnish the Department a copy of the survey of said hole when the drilling has been completed and before the casing has been set if an objection has been filed. Nothing in these rules shall be construed to permit the drilling of any well in such a manner that it crosses property lines. The Department shall have the right to make or to require the operator to make a directional survey of any hole, on its own initiative or at the request of an offset operator, and at the expense of said offset operator, prior to the completion of the well; and it shall have the authority to make or to require the operator to make, a directional survey of any hole at any time, and at the expense of the offending party, i.e., if the operator contends his hole is in a certain condition and it is found so to be, then party requesting survey should pay. . . . All new wells that have surface locations 300 ft or less from any property or unit line and that reach a depth of 4000 ft or more shall, beginning with the effective date of this order have directional surveys made to the total depth of the hole before setting final string of casing.

New Mexico

Rule III. — Deviation Tests. (a) When any well is drilled or deepened with rotary tools, tests to determine the deviation from the vertical shall be taken. When the deviation from the vertical in any 500-ft interval averages more than five deg. a directional survey shall be filed with the Commission before any oil or gas from the well is sold so as to determine that the bottom of the hole is on the lease where the well is drilled.

Texas

Rule 54 of the Railroad Commission of Texas regulates the deviation of a bore hole from the vertical or from its normal course in an intended predetermined direction or course.

While it will be seen from the above examples that the present rules and regulations of the Conservation agencies of some of the states may prohibit the range of deviation which may be desired in accomplishing the desired results in decreasing drilling costs, nevertheless, such agencies have the power to amend such rules and regulations.

It is believed that the Conservation agencies of all of the states, regardless of their existing rules and regulations, would look with favor upon any reasonable rules and regulations which would permit operations in any manner so as to decrease drilling costs and at the same time prevent inequities from the intentional deflection of a well, the trespass upon other property and wanton disregard of the deviation of a well, and that all such agencies have the power to promulgate any such rules and regulations which may be necessary to accomplish the desired results. ★ ★ ★

The Author

A. B. Tanco is a member of the Legal Department of The Atlantic Refining Company in Dallas, Texas. A member of the State Bar of Texas and The Dallas Bar Association, he has been in the employ of Atlantic since 1920. Experience was first in the company's office in Tulsa, Oklahoma, in the Land and Legal Department. In 1930, he was transferred to the Legal Department in Dallas where he has been engaged in legal work pertaining to oil and gas operations.

Choya Drilling Company, Inc.
Installs FIRST . . .

High Temperature Cooling For Drilling Engines

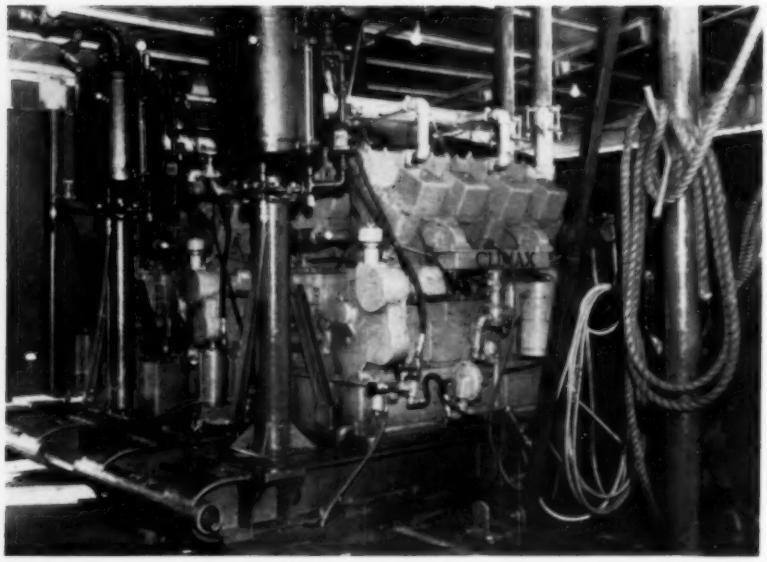


FIG. 1. **No radiators, fans or water pumps** on these drilling engines equipped with steam separators for high temperature cooling.

Horsepower increased by eliminating parasitic loads and radiator. Fuel, lube and maintenance costs reduced

Donald M. Taylor
Gulf Coast Editor

THE first rotary rig anywhere to be equipped with high temperature cooling on drilling engines is that of Choya Drilling Company, Inc.'s Rig No. 1, operating out of the firm's Midland, Texas, headquarters. High temperature cooling (sometimes referred to as Vapor Phase or adiabatic cooling) eliminates many items required in conventional drilling engine cooling systems. By leaving off the radiators, fans and water pumps and equipping the engines with steam separators and a small condensor, Choya increased the horsepower of drilling engines nearly 20 percent, and lowered operating and maintenance costs.

Engineers say power of each of the rig's two main engines has been increased from 265 hp to 325 hp while operating at the same manifold pressures. Cost of this conversion ran about $6 for each additional horsepower. This compares with an engine cost of about $35 per hp. Electric horsepower to cool both engines is a 3 hp motor.

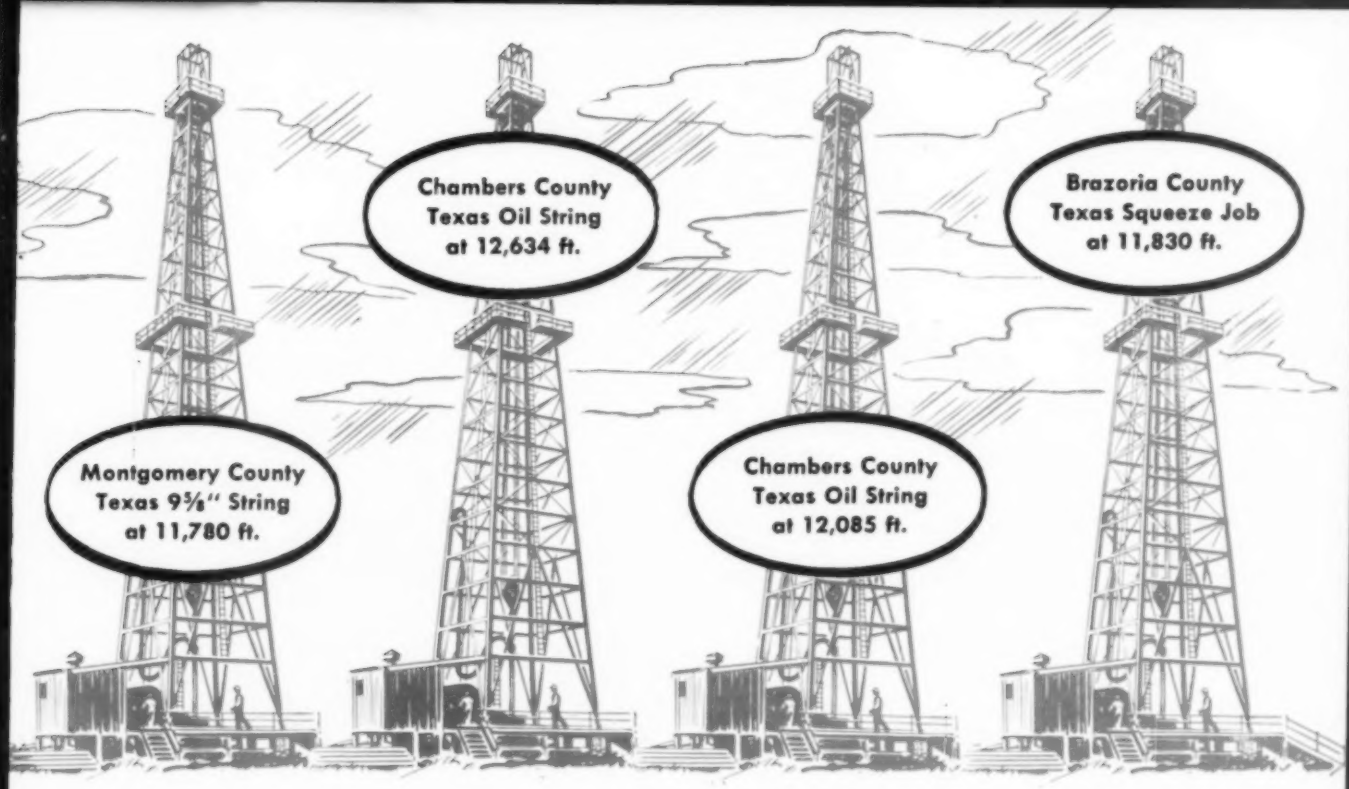
What is high temp cooling? There's no secret to high temperature cooling, and it will work on any type internal combustion engine. It simply means cooling the engine by letting water in the jackets boil. The cylinder heads and liners are kept flooded with water at boiling temperature, and the heat is used up in converting water to steam. The rejected heat leaves the jackets in the form of steam, either utilized for power or heat, or condensed in a small cooling unit. The condensate returns to the engine at just about the same temperature as the steam.

High temperature cooling is not a new idea. It's been tested and proved. In recent years, engines totaling more than 250,000 hp have been converted to this method of cooling in the U. S. The idea has revolutionized the tug boat industry on the Mississippi River. By switching diesels to high temperature cooling, tug operators have found they can burn cheap Bunker C oil in place of expensive diesel fuel. In so doing, they raised the engine horsepower and lowered operating costs.

There have been many other dramatic successes with this system. A heat balance on a 1750 hp engine in a Los Angeles sludge plant indicated an engine efficiency of 75.53 percent. (Ordinarily engineers are happy with 37 percent.) In this instance, however, steam from the engine jackets was utilized.

Hy-Bon Engineering Company of Midland, Texas, and Engineering Controls, Inc., who designed Choya's high temperature units has handled similar units totaling something like 15,000 hp for gas compressor stations in West Texas. One of the more interesting installations is in a gasoline plant. Here, six 1250-hp gas engines are equipped with high temperature cooling. This greatly improves engine performance; but at the same time, steam from the jackets is used to obtain 750 tons of refrigeration for gas cooling. At another plant nearby, steam from 1650 hp units is used to power steam turbines to condense engine jacket steam.

Choya's units. To fully appreciate the advantages of high temperature cooling, you have only to visit Choya's rig. You'll find the rig unusually spic and span and somewhat similar to many other 7500-ft rigs operating in the area.



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The big difference, of course, is in the engines. In place of the usual radiators, fans and water pumps there are small cylindrical steam separators mounted on stanchions above the engines. Off the rig floor, there's a small steam condenser.

Men in the crew jokingly refer to the separators as "percolators," yet they marvel at the way the cooling system has solved a difficult maintenance problem. In the past, they had to change radiator cores frequently because of the hard West Texas water. In between times, they had to de-scale engine jackets to keep them from overheating. High temperature cooling solved these problems. It requires little or no make-up water and this limits the amount of scale that can possibly form. Besides, the system would de-scale itself. Steam forming in the scale knocks it off the metal parts.

Take a look at the thermometers on the engines, and you'll see why high temperature cooling offers so many long range benefits. Temperature of inlet water and outlet steam will be about the same — say 217 and 218 F respectively. Lube oil temperature is but slightly lower at 215 F. This virtually eliminates thermal stresses. There's no cold water washing against the liner skirts chilling them below the temperature of the upper part of the liner. This means that the cylinder liner is just about the same temperature throughout the piston travel—naturally this means less wear.

Less wear of rings, piston and liners mean less blow-by and consequently less contamination of the lube oil. But even if there were lube oil contamination, it wouldn't be particularly harmful. The temperature of the oil is above the vaporization point of both fuel and water. Thus any diluent is quickly evaporated by the oil itself. Importance of this fact can't be overstressed, because almost any attack on the metals inside the crankcase is dependent on water. Not even hydrogen sulfide can effectively attack metals when water is absent.

An old time engine man would probably find this high lube oil temperature alarming. But several refiners have guaranteed their oil to withstand far higher temperatures indefinitely. Choya is using a popular brand of heavy-duty, light detergent SAE 50 weight oil, which is standing up under this service with ease.

As a matter of fact, one of the big puzzles Choya has yet to solve is when to change oil. The company started by changing oil every 100 hours, but laboratory tests at the end of the period revealed no reason for changing. The interval between changes has been gradually advanced to 175 hours, and even at the end of this period, there's no evidence the oil needs changing.

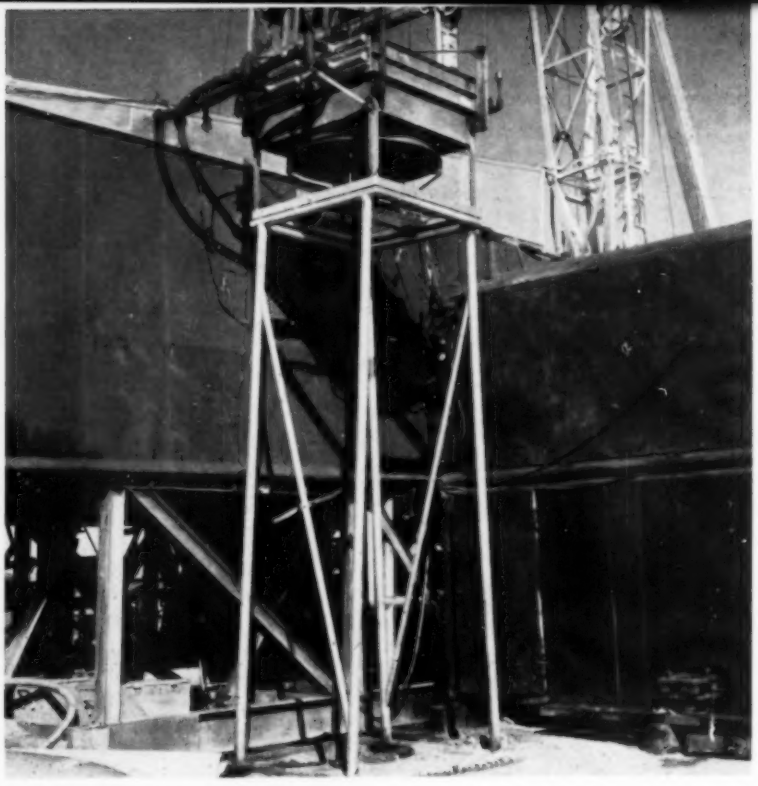


FIG. 2. **Steam condenser** elevated for thermal circulation must handle 4 gpm of condensate to cool two engines developing 650 hp.

The increase in horsepower that Choya has experienced is typical of high temperature installations. Indeed, it would be almost impossible not to have an increase, because the parasitic load of the water pump and cooling fan is eliminated or at least virtually eliminated, and the power is added to the engine output.

High temperature cooling may or may not require a small parasitic load. If the engines are piped as shown in Fig. 3, the condensate is returned to the engine jackets by thermal circulation, and the fan on the condenser may be driven by steam from the unit. In this case, none of the engine's horsepower is used by the cooling system.

Circulating requirements. Designers of the equipment have found that the average engines require about .108 gpm of circulating condensate per bhp.

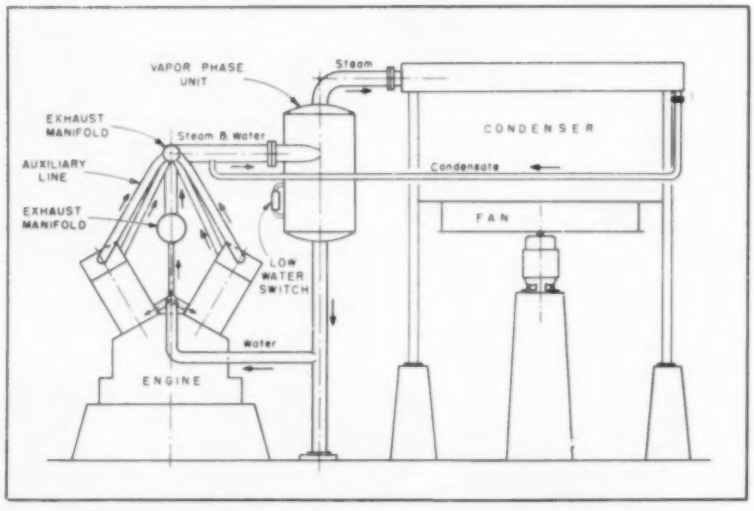


FIG. 3. **High temperature cooling cycle** using thermal circulation. Engine jackets flooded with water at boiling temperature. Steam and water goes to separator; steam to condenser and water returns to jacket.

Thus a 300-hp engine would require a circulation of about 32.4 gpm. Of this amount, only 2 gpm is condensate, the other 30 gpm is water carried over to the separator by the steam. To cool the same engine with water in the liquid phase, about 180 gpm would be required to obtain a 10 F rise across the engine.

The explanation is that each pound of water will absorb only one Btu per pound per degree rise. In fact this is the definition of a Btu. But in high temperature cooling, most of the heat is removed as latent heat, and it takes 970 Btu's to convert one pound of water into one pound of steam at the same temperature.

Condensing requirements. Where the steam is not utilized for heat or power it is necessary to condense it, and the most feasible means is by an atmospheric cooler. This cooling equipment can be smaller than the one ordinarily required for conventional cooling for the simple reason that there is a greater difference in temperatures between the surrounding air and the steam.

Thermal circulation cycle. Choya's initial installation was designed for thermal circulation of the coolant. This requires that the condenser, and steam separator be elevated above the engine to provide a head for the condensate return. There are several advantages to this system: For one thing, it requires no power for circulation of coolant. Also, the more heat rejected by the engine, the faster the circulation. On start-up when no steam is formed, there will be little circulation. But the faster steam is formed, the faster it is condensed and returned to the engine.

Piping for thermal circulation. The most important aspect of piping the engines for thermal circulation is to prevent restrictions in the system. The outlet line should be large enough to handle a high volume of steam, while the inlet line can be small. On a 1000-hp engine, the outlet line should be 8 in. in diameter while the water inlet line can be 4 in. and the condensate line 1½ in. The latter will handle only 6 gpm.

Power requirements without thermal circulation. As shown in Fig. 6 where the condenser is moved below the operating level of the steam separator, it will be necessary to pump the condensate back into the separator. As previously mentioned, the steam condensate for a 300-hp engine operating at full load will be only 2 gpm, and the water circulation from the separator will amount to about 30 gpm. The latter can be circulated by gravity, and a fractional horsepower electric motor pump easily will handle the condensate.

Cooling efficiency. Efficiency of cooling power cylinders with water at boiling temperatures greatly excels that of conventional cold water cooling. For proof, watch the waitress in the drug store make coffee in the pyrex glass pots — or simply heat a pan of cold water on the kitchen stove.

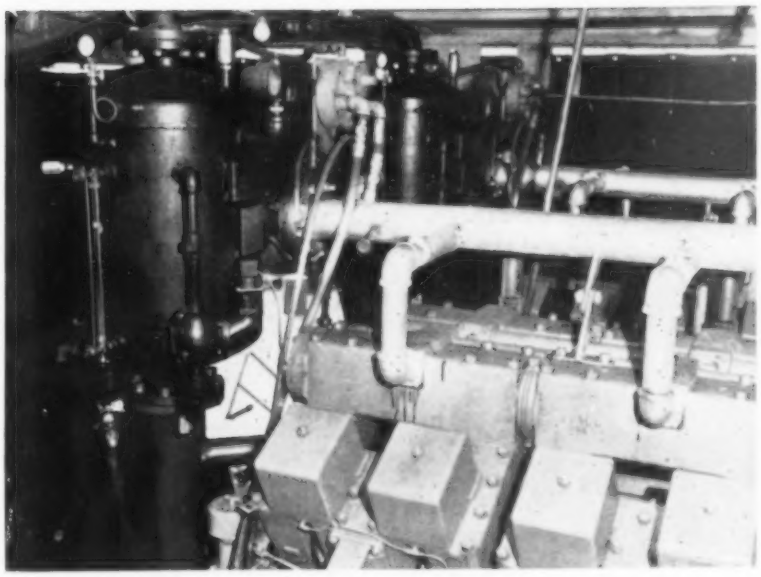
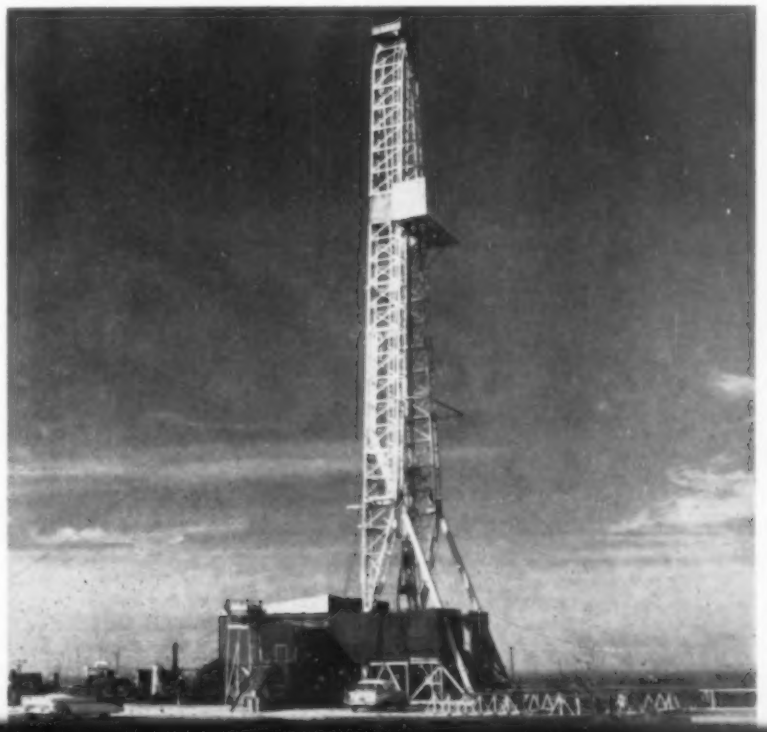


FIG. 4. **Steam separators mounted above engine** have low-water shut-off. Note small exchanger above header. Hot water warms up butane-propane fuel in the small unit.

Right off the bat, a myriad of minute steam bubbles form opposite all heated surfaces. This layer of bubbles not only acts as an insulating blanket, but adds a step to the heat exchange process. Here's what has happened. The heat penetrates the container and is converted from sensible heat to latent heat as steam. But to heat the water, the steam must give up its latent heat and this is in reality an additional step in the heat transfer from the heat source to the water.

This is what happens in an engine with conventional cooling. Heat from the power cylinders penetrates the head and liners, forms a blanket of steam bubbles which must be washed away at a very rapid rate to achieve any effici-

FIG. 5. **World's first drilling rig** to be fully equipped for high temperature cooling is drilling below 10,000 ft near Andrews, Texas.



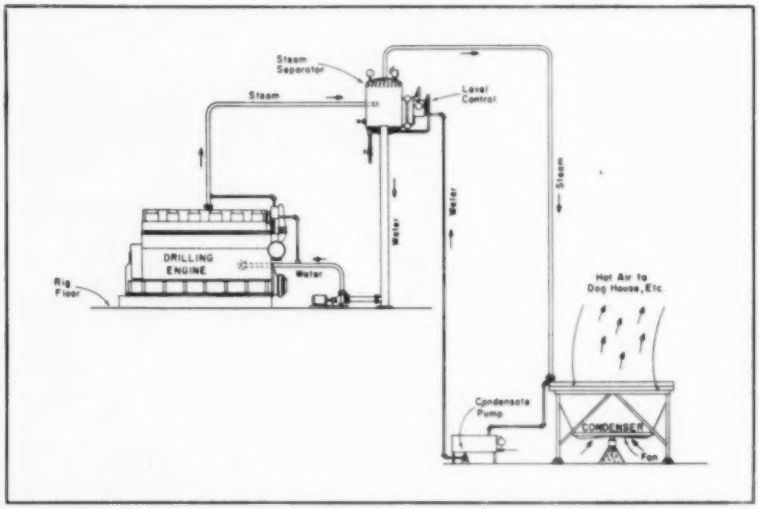


FIG. 6. **High temperature cooling** with forced circulation rather than thermal circulation. Small condensate return pump is driven by fractional horsepower motor. Hot condenser air can be used for heating.

ency in heat transfer. Often, the transfer from latent to sensible heat may not occur until the water and bubbles are out of the engine.

Contrast this with the action of water once it starts boiling. Heat transfer is direct and rapid. Take a pan of water at the boiling temperature and move it about over a small flame. The boiling area will follow the flame.

Advantages of this action in an engine are obvious. The upper part of the liner has far more heat to exchange than the skirt, and within the engine the ebullition takes place more rapidly along the upper part of the liner than along the lower part. This keeps the entire liner at about the same temperature.

Temperatures inside the engine. Fig. 7 shows a number of studies of metal and water temperatures inside the engines. The thermocouples designated (M) were sealed in the cylinder metal.

Note that the temperature of the metals in the units cooled with high temperature units is fairly stable. Where conventional cooling is used, the temperatures vary considerably, and the temperature in the upper portion is about the same or higher than that of high temperature cooling.

Lube oil cooling. Where dry-type pistons are used, lube oil cooling is not required. But where oil-cooled pistons are used, the oil must be cooled. In the latter case, the lube oil cooling can enter right into the high temperature cooling unit.

Fuels. Sour gas and sour crude have been used successfully in many installations. As a matter of fact, engines have operated for years on gas containing a high percentage of H_2S; and diesel engines have operated on fuel oils containing as much as 3 percent sulfur. This is possible because, the temperature of the engine parts is above the boiling point of water; and this is the necessary ingredient in the formation of acids.

Converting Engines

Any internal combustion engine can be converted to high temperature cooling. If the gaskets will not withstand elevated temperatures, change them to asbestos metal clad ones or equal. Where rubber gaskets are necessary, they should be changed to silicon. Check manufacturer's pressure ratings for the engine jackets. Usually, this is at least 15 psi and this is sufficient.

So far as the equipment and controls for the system are concerned, they are simple and inexpensive.

Waste Heat Recovery

One of the biggest challenges of our time is our waste of fuel. Future generations may someday regard us as the thoughtless wasters of petroleum products. The average engine converts only 35 percent or so of fuel energy into work. The rest goes up the exhaust stack and out the jacket water and lube oil.

This is the average installation.

There are others achieving thermal efficiencies above 70 percent; it is not uncommon, and nothing new needs to be invented to make it possible. And surprisingly enough, even automobile engines could be vastly improved along these lines.

The most readily available means of salvaging a large portion of this energy lies in the field of high temperature cooling. When engine jackets will withstand higher pressures and this cooling

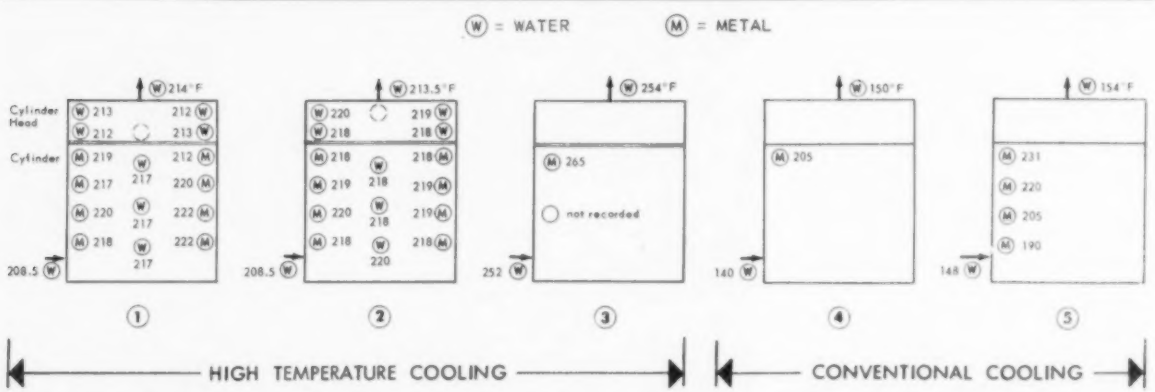


FIG. 7. **Actual temperatures of engine cylinders** when cooling with conventional water systems, right, and when cooling with high temperature cooling, left. (1) Number 3 cylinder of 880-hp four cycle engine, United Gas Company, Agua Dulce, Texas. (2) Same engine, number 7 cylinder. (3) Diesel, 120-bhp engine with high temperature cooling. (4) Conventionally cooled, turbo-charged 4-cycle 330-bhp diesel engine. (5) Four-cycle, 150-hp diesel.

"Oilwell" HI-BRIN Pumps are going places...

...where abrasion, corrosion and impact cause other pumps to fail!

HI-BRIN PUMPS RESIST ABRASION . . . because barrels have a core hardness above 1000 Vickers (equivalent to 69 on the Rockwell C Scale). "Oilwell's" patented Nitrocycle* hardening process produces a uniform nitrided layer without warpage. For this reason barrels can be and *ARE* HONED BEFORE HARDENING. After hardening and polishing, barrels are air gauge inspected over their entire length to a tolerance of plus .002" minus .000". This precision finishing permits close plunger fits, leaving little space for sand to lodge.

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HI-BRIN PUMPS RESIST IMPACT . . . because the extremely hard bore is backed-up with a very strong shell (150,000 psi Ultimate Strength) to withstand the shock loads, stresses and pressures encountered in deep wells.

Try HI-BRIN PUMPS

. . . in your own wells and learn for yourself how much they will . . . **SAVE ON PULLING COSTS.**

*Available only in "Oilwell" HI-BRIN Subsurface Pumps.

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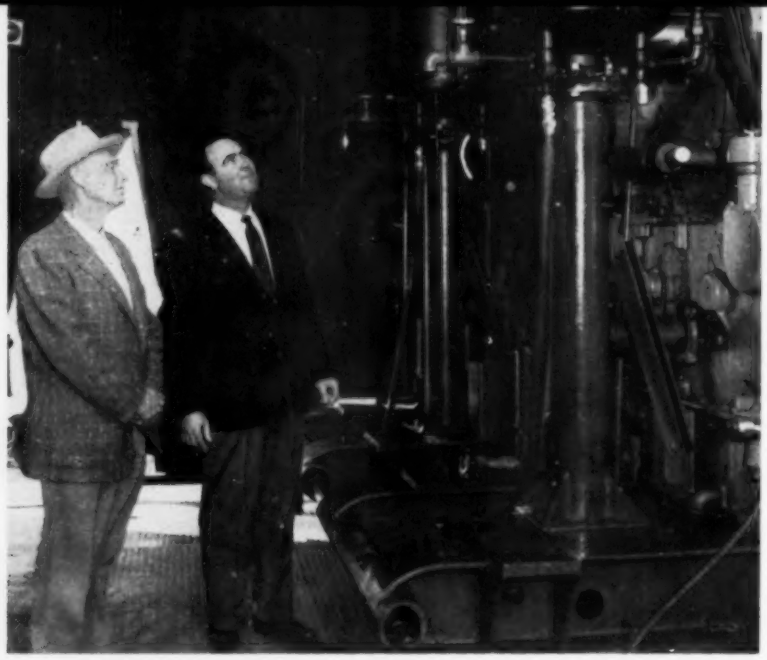


FIG. 8. **Inspecting steam separators** are Ralph N. Persons, Hy-Bon Engineering Company of Midland, Texas, designers of installation, and John N. Persons, president and general manager of Choya Drilling Company.

TABLE 1. Inspection Report of Tug Boat Diesel Engine After 30,000 Hours in Service.
(Courtesy Control Engineering Company, St. Louis, Missouri)

Crankshaft Main Brg. Journals
New—Min. 3.499"
Max. 3.500"

#1	3.497
#2	3.498
#3	3.498
#4	3.498
#5	3.498
#6	3.498
#7	3.498

Main Bearing Shells
New—Brg. thickness
Min. 0.1545"—Max. 0.1550"

	Upper half	Lower half
#1—	0.1540	0.1520
#2—	0.1540	0.1520
#3—	0.1540	0.1530
#4—	0.1540	0.1520
#5—	0.1540	0.1520
#6—	0.1540	0.1520

Crank Pin Bearings
New—Min. 2.749"
Max. 2.750"

#1	2.749
#2	2.749
#3	2.749
#4	2.748
#5	2.748
#6	2.748

Connecting Rod Brg. Shells
New—Brg. thickness
Min. 0.1545"—Max. 0.1550"

	Upper half	Lower half
#1—	0.1530	0.1540
#2—	0.1530	0.1540
#3—	0.1530	0.1540
#4—	0.1530	0.1540
#5—	0.1525	0.1540
#6—	0.1530	0.1540

PISTON
NEW DIMENSIONS

Top	Ring land	Skirt
4.219-4.222	4.235-4.238	4.2433-4.2455
#1—4.222	4.236	4.244
#1—4.222	4.236	4.244
#2—4.222	4.235	4.244
#3—4.222	4.234	4.244
#4—4.222	4.233	4.243
#5—4.222	4.237	4.244
#6—4.222	4.233	4.243

PISTON PIN
New—Min. 1.4996" Dia.
Max. 1.5000" Dia.

#1	1.4960
#2	1.4980
#3	1.4950
#4	1.4970
#5	1.4980
#6	1.4980

CRANKSHAFT THRUST WASHER
New—Min. thickness—0.1205"
Max. —0.1220"
Lowest reading—0.1195
Highest reading—0.1215

CAM AND BALANCE THRUST WASHERS
New—Min. thickness—0.120"
Max. —0.122"
Lowest reading—0.1195"
Highest reading—0.1215"

BALANCE SHAFT
New (Brg. Dia.)
Min.—1.4970"
Max.—1.4975"
Front & rear reading—
1.4970" Dia.

CAM SHAFT
New (Brg. Dia.)
Min.—1.4970"
Max.—1.4975"
Front—1.4970"
Rear—1.4975"

GEAR TRAIN
New-Lash
Min. —0.003"
Max.—0.008"
Actual—0.010"

CYLINDER LINERS
New—I D Min. 4.2495"
Max. 4.2505"

TOP	BOTTOM
#1—4.255	4.257
#2—4.253	4.257
#3—4.255	4.257
#4—4.254	4.256
#5—4.254	4.256
#6—4.255	4.258

EXHAUST VALVE STEM
New—Min. 0.3415" Dia.
Max. 0.3425"

#1—0.3390	#7—0.3410
#2—0.3410	#8—0.3410
#3—0.3385	#9—0.3390
#4—0.3390	#10—0.3410
#5—0.3400	#11—0.410
#6—0.3380	#12—0.3385

EXHAUST VALVE GUIDE
New—Min. 0.3445" Dia.
Max. 0.3455"
All guides had .002" — .003" wear.

WESTERN MACHINERY & ENGINE COMPANY

INSPECTED BY: E. Macke

DATE: 1-26-56

APPROVED BY: J. R. Lundahl

system is coupled with exhaust heat economizers, probably 80 or even 90 percent thermal efficiency may be possible.

Engine wear. Wasting fuel is not the only sin of our time against ultimate mechanical utilization. Another is engine wear. Just examine the inspection report (Table 1) of a 200-hp engine which had been in service for more than 30,000 hours without an overhaul. It originally had been equipped with high temperature cooling as a means of lowering fuel costs. It powered a tug on the Mississippi River.

Summary of Advantages

The reason there have been so many conversions to high temperature cooling lies in the advantages of the system. It was these advantages that led Choya Drilling Company, Inc., to convert Rig No. 1 and the same advantages will

FIG. 9. **Elmo Pope,** Choya drilling superintendent, at the driller's console.

lead other companies into similar moves.

Summed up, here are some of the advantages:

1. Temperatures in the engine are uniform — they are controlled by the natural law of boiling.
2. Thermal stresses and consequent excessive wear are minimized because of uniform temperatures.
3. Parasitic load of fans and water pump can be eliminated or greatly reduced.
4. Engines warm up faster.
5. There is less sludge, blow-by and corrosion in the engine.
6. Fuels containing sulfur and H_2S can be used successfully.
7. There is little or no scaling inside the engine jackets.
8. Jacket temperatures constant at any load and independent of ambient temperature.

Acknowledgment

The author wishes to thank John N. Persons, president and general manager of Choya Drilling Company, Inc., and Ralph N. Nelson, of Hy-Bon Engineering Company for their generous help in preparing this article. ★ ★ ★

For Drilling Contractors Only:

How to Sell More than Just So Many Feet of Hole

Whether he realizes it or not, the contractor has a big selling job to do. Take these timely tips of one of the nation's outstanding sales consultants

Eugene Whitmore
Sales Consultant,
Lockhart, Texas

DISCUSSING the drilling contractor's selling problem with a well known contractor in South Texas recently the contractor said to me:

"Gene, the biggest part of our business comes from old customers. These people have known us for 20 years or more, and I do not see where we have a selling problem such as you describe."

A few minutes later we listed three producers who have new men in charge of drilling. My friend the contractor knew none of these men, and he admitted that it was likely none of them knew him.

Proof that a good job of selling is a powerful factor in the contractor's picture is the record of a couple of fairly young contracting organizations that have chalked up spectacular growth records in a very few years, in an area where competition is extremely active. Both these contracting companies have employed every known and modern sales technique.

Sales Problem

Suppose we stop for a minute and try to take this drilling contractor sales problem to pieces and look at the parts.

First, even before the contractor receives a request to bid, the producer must know the contractor's name, address, and field of operations. He must also know that this contractor is able and willing to operate in the area the proposed hole is to be drilled.

Getting on the List

Once the contractor gets this far — gets his name upon an approved list of bidders, he has taken the first step. His name is on a list of a number of contractors, with varying degrees of additional information about him. Regularly this list changes in one way or another: New names are added; other names may be removed. An active producer's list is never static.

Up to now many different contractors are about equal; their names are on the list. They are like a group of runners waiting for the starting pistol in a race. No one knows who has the best chance to win.

When we dig into the facts about this list of approved bidders we find many other factors. On this list are some contractors who have previously worked for the producer. Those who have turned in good records and whose performance has been satisfactory have an advantage over all the others — because they are known. In some cases requests to bid may be held down only to those contractors who have had previous contracts with the producer. In other cases bid requests may be sent to a larger list.

Three Types of Bidders

Suppose we say that a fairly large list of contractors receive a request to bid on a hole in a certain area. Some have had previous jobs from the producer, others are known to the producer, still others are unknown to the producer.

Here we have three categories of bidders; each one has a sales problem, differing only in intensity of the problem. **The contractors who have had previous contracts with the producer need to:**

1. **Prove that their equipment has been well maintained;**
2. **Prove that their organization is intact and functioning; and,**
3. **Inform the producer of any new equipment acquired since the last previous contract.**

I asked one contractor how he handled this problem. "Oh hell, I just pick up the telephone and call the guy on the phone and chat with him, and tell him my bid is in the mail."

Is this enough? Suppose more than one man is "in" on letting the contract. The man on the other end of the contractor's line may be very busy and for-

For Sale: More Than Just So Many Feet of Hole.

DRISCOSE*, HIGH-PURITY CMC (99.9%)

Relying wholly upon infrequent personal contacts, assuming "that everybody knows me" and hoping contracts will come in over the transom may end up in idle rigs.

get all about the conversation. A written proposal, including all facts about recent experience in the area, listing all new equipment, and reminding the producer about experienced personnel may go a long way toward winning the contract. Of course the telephone call is all to the good, but in today's competitive picture it may not be enough.

A Nobody — or Somebody

Now let's take another contractor's name on the approved list of possible bidders. This contractor has a good reputation. He, or one of his men has visited the producer's office, has done a selling job, and has been successful in getting his name on the approved list.

Fact is, however, it is still only a name on a mailing list. There is no data about previous experience in the area, no data about equipment, personnel, financial strength.

Suppose this unknown contractor receives a request to bid. He figures the job carefully, and writes a letter, or fills out a form giving his price per foot.

Is that enough? When we get right down to letting the contract, do the executives in the producer's office have enough information about this contractor to award him a contract? They may know much about the contractor, but their information is hazy. They think he drilled a certain well in the same area, but are not sure. They think he has a good toolpusher, but they may wonder if this man is still on the same job.

Bare Facts

Now let's pick up another bid on the same well. It is from a contractor, who like the first fellow we talked about, has never had a contract from the producer. With his bid comes a written outline covering experience, organization, equipment, financial strength, along with a record of his work in the same area. Put yourself in the producer's shoes — to which contractor would you award the job, other things being equal?

With conditions as they are today the contractor simply cannot afford to take it for granted that the contract letting officer in any producer's organization knows all about the contractor's ability to deliver a job.

If you can point out a group of busier men than the contract letting officers in oil companies I do not know who they are. These men must have a million facts at their command. It is impossible for them to carry—in their heads — all the information about the many contractors with whom they may do business.

Only the contractor who constantly pours data about his organization and experience to these men can hope to compete successfully with the other contractors who are known, who keep the producer's men informed of every new development.

On Your Toes!

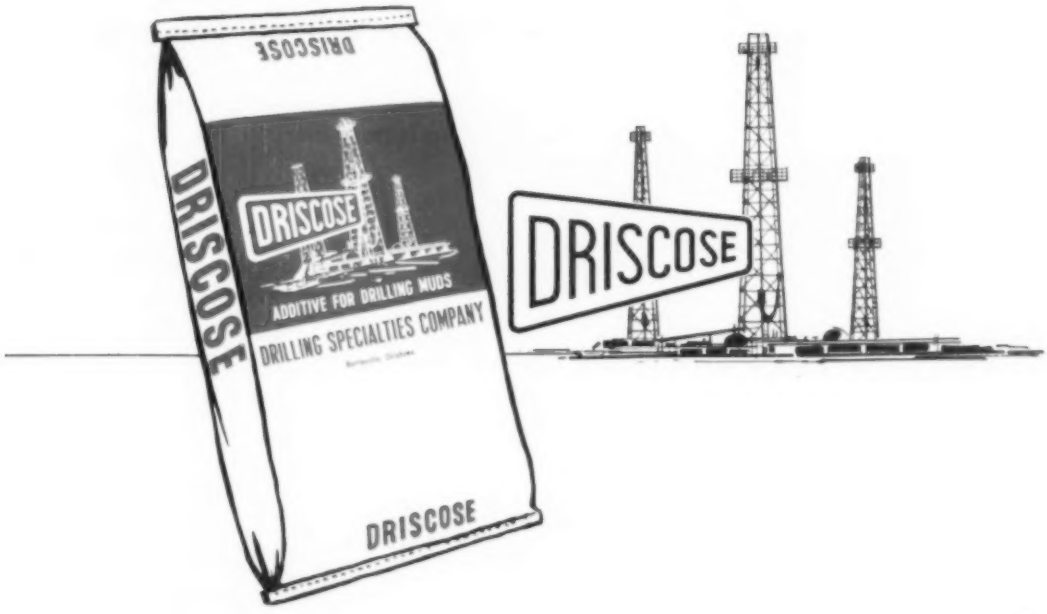
Now comes the $64 question. How can a contractor maintain this flow of data to his prospects? The answer comes in many different forms. First, as many contractors do, he may visit his best prospects in person and keep them informed. These visits should be friendly, informal, and helpful to the producer. During the visits be sure to mention any new equipment, any additions to personnel, and any unusual experience. The point is to keep the contractor's prospects and customers thinking: "There's a contractor who is

SELLING POINTERS FOR DRILLING CONTRACTORS:

1. **Know your producer customer.**
2. **Get acquainted with his key men.**
3. **Keep these individuals informed on:**
   - a. **How well your equipment is maintained.**
   - b. **How your orgnization functions, that it is intact.**
   - c. **New equipment you've acquired recently.**
   - d. **How you performed for others.**
4. **Make a detailed written proposal on every bid.**
5. **Provide other information about your company to permit a full evaluation of your operations.**

KNOW YOUR CUSTOMER'S OPERATION— GET ACQUAINTED WITH KEY MEN.

DRISCOSE*, HIGH-PURITY CMC (99.9%)



ONE OF THE BEST THINGS THAT EVER HAPPENED TO DRILLING FLUIDS!

DRILLING SPECIALTIES COMPANY

Bartlesville, Oklahoma

* Driscose is a trademark for 99.9% pure Sodium Carboxymethylcellulose.

Only through a thorough, well-planned, carefully documented sales program can the contractor hope to maintain his volume, and keep his equipment busy under today's competitive conditions.

right up on his toes. Better give him a shot at our next hole."

But the contractor's time is limited. He often wishes he were three men, who could be in three places at once. He does not have hours enough to do a large amount of this visiting and customer relations work. He may not have anyone in his organization to make these calls, carry a continuous customer-relations program. Is there a substitute for personal calls in customer and prospect relations programs.

SPREAD THE WORD BY:

1. **Friendly, informal visits with prospects.**
2. **Give the customer brochures or printed matter on equipment and operations, and personnel.**
3. **Advertise . . . trade publications, direct mail, letters, booklets, news letters and your own company magazines.**

Many drilling contractors have proved that advertising can do at least a part of the contractor's selling job. They advertise in the industry magazines; they use direct mail, letters, booklets, news letters and, in some cases, company magazines.

No News is Good News?

"Oh, that junk is of no value," one contractor told me. "Most of the advertising I get in the mail goes right into the waste basket." This is, of course, the plain truth. A very high percentage of *all* direct mail goes into somebody's wastebasket — file 13 — if you please. But the one, two or three percent of such advertising mail which does *not* go into the wastebasket makes the entire mailing profitable.

Brochures

The basic piece in the sales programs of many contractors is an illustrated booklet or brochure, which is revised frequently, and mailed to all prospects and key men in the contractor's operating area. Some of these brochures are elaborately illustrated in color, large in size and extremely impressive.

Booklets

Others are simple 8 to 16 page booklets, giving outlines of the contractor's experience, equipment, organization, including pictures of his rigs at work, his headquarters yards, rolling stock and machinery.

Newsletters

In addition to these booklets some contractors have found it profitable to mail a newsletter at regular intervals. These letters are exactly what their titles indicate. They give news of the contractor's personnel, items about new equipment, information about wells in progress, and anything else that may be of interest to the producer. The same type of material may go into a small magazine-type mailing. Newsletters are as a rule, not illustrated, but the magazines usually carry several illustrations showing the contractor's current activities.

Perhaps a word of warning should be included: Do not start a newsletter or a company magazine without careful planning. Determine in advance who, in your organization, will be responsible for: (1) Gathering basic information; (2) writing the copy and obtaining the pictures; (3) following the job through the printers; (4) handling the mailing list preparation, constant revision and addition, and (5) supervising the actual mailing.

Unless the contractor has a well-rounded office organization it may be better to farm out as much of this operation as possible, including addressing, folding, inserting and mailing.

Calendars

The use of calendars, advertising specialties and similar advertising items such as book matches is too well known to need comment here. These items, however, are a real factor in any sales activity of the drilling contractor.

Something to Sell

At a meeting in 1956, and during many visits with contractors I have found a generally increasing appreciation of the simple fact that every contractor has much more to sell than just so many feet of hole. Some well established contractors have much more to sell than they realize. As a general rule, I believe it to be true that the younger drilling organizations are doing a better job of selling than the older, more firmly established contractors. This indicates that the newer, more aggressive firms may be chipping away at the customers of the old-timers in the business at a faster clip than some old-timers realize.

The contractor's basic selling job is to disseminate as much pertinent information about his organization and its services as possible. When the con-

WHO, ME ADVERTISE?

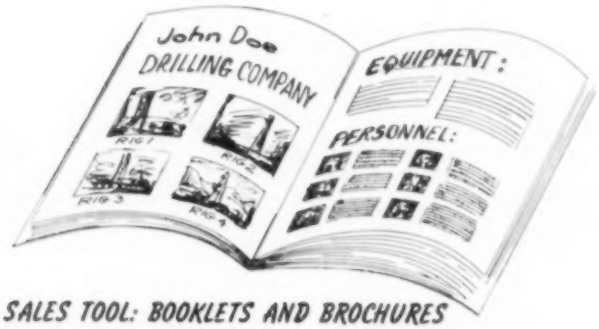
Basic job: Disseminate as much pertinent information about his organization and its services as possible. He needs to sell:

1. **His reputation, character and experience.**
2. **Personnel ability and experience.**
3. **Equipment.**
4. **His good public relations with others.**

tractors' sales problem is analyzed, it breaks down into a list of simple activities that "can be put down on the back of an envelope."

The drilling contractor needs to sell:

1. **His character, reputation, experience.**
2. **His personnel—his executive and operating organization's experience, length of service, and skills.**
3. **Financial resources. He needs to prove that he has the financial ability to complete a well, no matter what difficulties may arise.**
4. **The fact that his equipment is up to date, in good condition, and is well maintained.**
5. **His ability to achieve good public relations. He should prove that he does not "sour" a community when he drills a hole there. He should also submit evidence that his organization gets along well with suppliers, with other service organizations involved in completion, with the land owner, county and state officials, etc.**



SALES TOOL: BOOKLETS AND BROCHURES ABOUT YOUR COMPANY ARE JUST AS USEFUL AS A PIECE OF DRILLING EQUIPMENT.

The Author

Gene Whitmore grew up in an atmosphere of oil drilling and production in Caldwell County, Texas. Then he went to Chicago and New York and spent 35 years in sales, publishing and advertising. He was the first managing editor of Sales Management magazine, later editor for 18 years of American Business magazine.

Since 1920 he has been a member of the widely-known Dartnell Corporation's staff of sales research specialists who carry on a continuous study of sales, sales promotion and advertising activities of America's top companies.

He has just published his third book, *Building Your Business With Calendar and Specialty Advertising*. Other books by Whitmore are: *Helping People Buy, The Office Equipment Merchandiser*, and, in collaboration with J. C. Aspley, *Industrial Relations Handbook*. Whitmore is now a sales consultant for several nationally known manufacturers.

Sales Portfolio

To do this he needs documentary evidence: A sales portfolio jam-packed with pictures, reproductions of letters from satisfied customers, a list of wells drilled, in what geological structures, time required on different contracts, etc.

He needs to show in this portfolio the kind of "housekeeper" he is, with pictorial evidence of a neat, well-kept yard at headquarters, and neat, well-policed operations on the drilling site.

With the entire industry lashing itself about public relations, the contractor needs to prove that his work improves, and does not harm the overall public relations picture of the industry.

Need Help?

Many contractors are able to prepare their own sales portfolios, but others find it more satisfactory to engage an outside firm to prepare this material, just as many companies hire outside consultants and specialists to prepare advertising, annual reports and other sales material.

The time is passing when a mere letter of transmittal accompanied by a bid, will land contracts.

The tension at which everybody in industry works today, the myriad attempts by others to win the attention of producers, the invasion of contracting by new companies, intensified competition—these and other factors mean that every contractor, no matter how well established, needs to maintain constant contact with his customers and prospects.

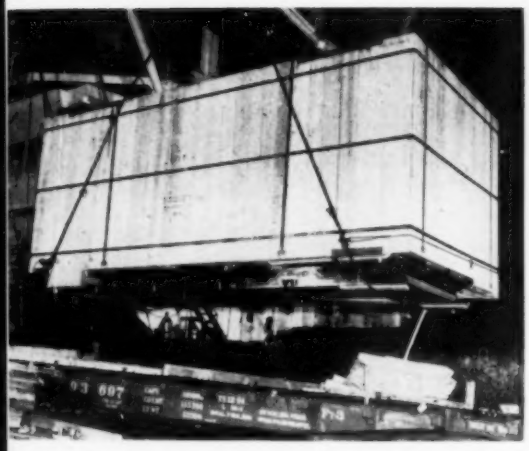
Relying wholly upon infrequent personal contacts, assuming that "everybody knows me," and hoping that contracts will come in over the transom may end up in idle rigs.

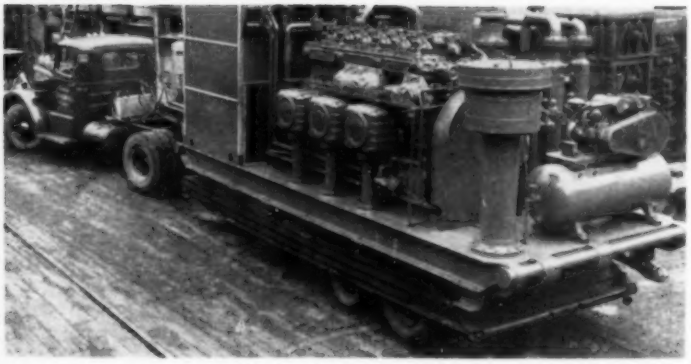
Today it is more difficult than ever to maintain frequent personal contact with producers: Their work burdens are heavier, and like the contractor himself, they may be short of adequate help, and tied to a heavy schedule of office work and travel.

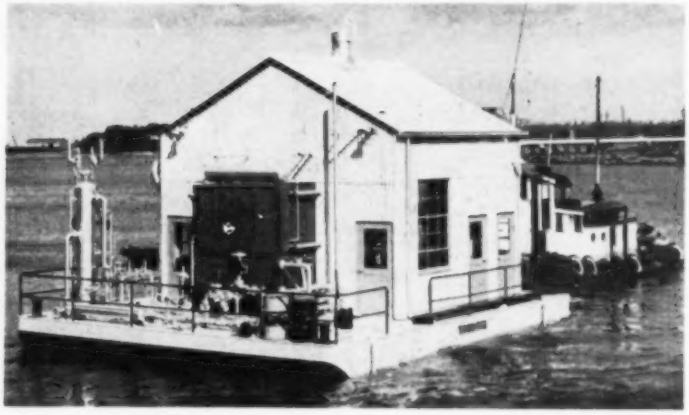
Influencing the Influential

There is still another factor, that prevails especially in the bigger companies, which requires intensified sales effort by the contractors: It is the increasing practice of committee management, with all decisions being placed before a committee. More and more business policies require that heavy responsibilities be shared by several men. It is therefore necessary to reach more men than previously, simply because more men may have a word in deciding who is to obtain a drilling contract.

Only through a thorough, well-planned, carefully documented sales program can the contractor hope to maintain his volume, and keep his equipment busy under today's conditions which, like almost everything else, "ain't what they used to be." ★ ★ ★







By rail, truck and barge, package compressor units go to the job. If the concrete slab foundation is poured, they can be installed and working in a few hours time after reaching the jobsite.

Quick installation, high salvage value . . .

PACKAGED COMPRESSORS Cut Production Costs

Flexible units can be added one at a time to field compressor station as gas production increases. When the field declines, they can be moved

Donald M. Taylor
Gulf Coast Editor

IN these days when everything from houses to drilling rigs is being factory pre-fabricated, it's not surprising that companies engaged in prefabricating compressor units are making hay in the oil patch.

There are all types and varieties of the units on the market today with horsepower runs from 240 to 660 — and it's an open secret that larger units are under test. All of the units are highly portable; most of them can be hauled on a single truck float. These are assembly-line produced and skid-mounted with everything from suction and discharge bottles to scrubbers and gas cooling sections in a single neat package.

What are the advantages of the packaged units? These are numerous; most of them grounded in economics. First, horsepower for horsepower, costs are less. Moreover, it is usually well constructed and requires no engineering design on the part of the purchaser.

Time and money are regarded as somewhat interchangeable commodities, and therein lies another advantage of the packaged unit. Strictly speaking, it requires nothing more than a concrete slab in the way of preparation for field installation; although most operators prefer a shed or compressor building for maintenance purposes. Where time means dollars, it is possible to move in the units and place them in operation in a matter of hours. To do this, it is only necessary to level the skid, bolt it to the slab and connect suction and discharge piping to field lines.

Units are as flexible as a salesman with an air travel card. They can be used over and over again and most times the salvage value runs about 90

Dual Completions call for

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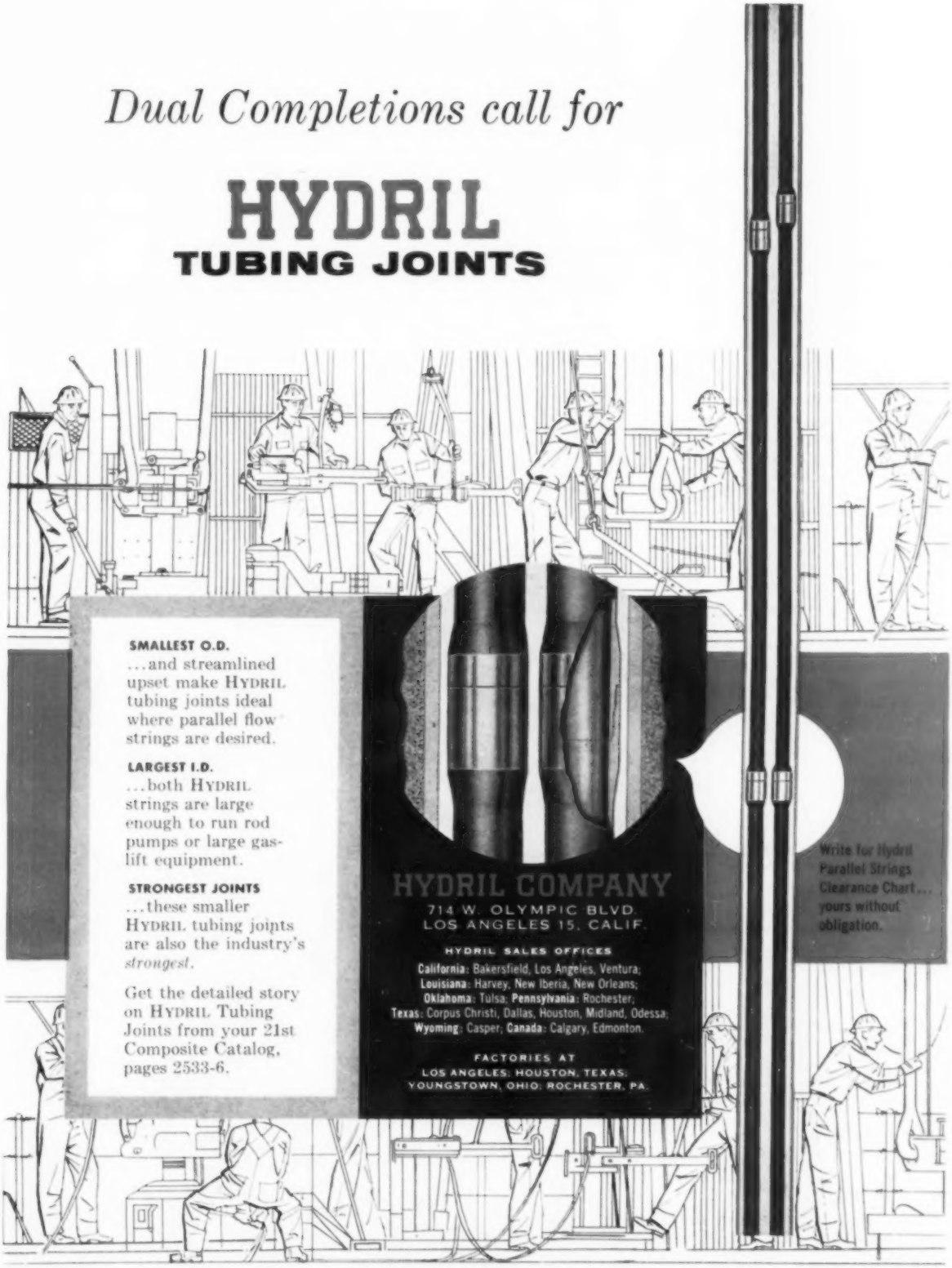

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percent or better. As a matter of fact, one large oil company has found that the salvage value runs something like $175 per hp where stationary units run about $50 per hp.

The biggest advantage of all is that units are flexible and inexpensive enough to make practical the addition of one or two packages at a time to a field compressor station as the field develops, and remove them in the same manner as the field declines. Units can be readily moved to other fields for additional service.

At least one company is following this plan in an Oklahoma oil field. Packaged units of 550 hp are being added to a station as the field develops. The cost is only $180 per hp. Units operate outdoors and the only preparation made for field installation was the pouring of concrete slabs for individual units and the laying of large suction and discharge gas manifolds. Horsepower of this field installation can be varied from 550 up to 12,000 or so, and back again depending on the optimum power needed for the field as production waxes and wanes.

This flexible station points up one of the many big savings in packaged compressors for oil and gas producers. But before we discuss savings, let's take a look at the units themselves.

There are a number of manufacturers who fabricate packaged units, and all of them perform the work under ideal conditions in strict accordance with applicable codes.

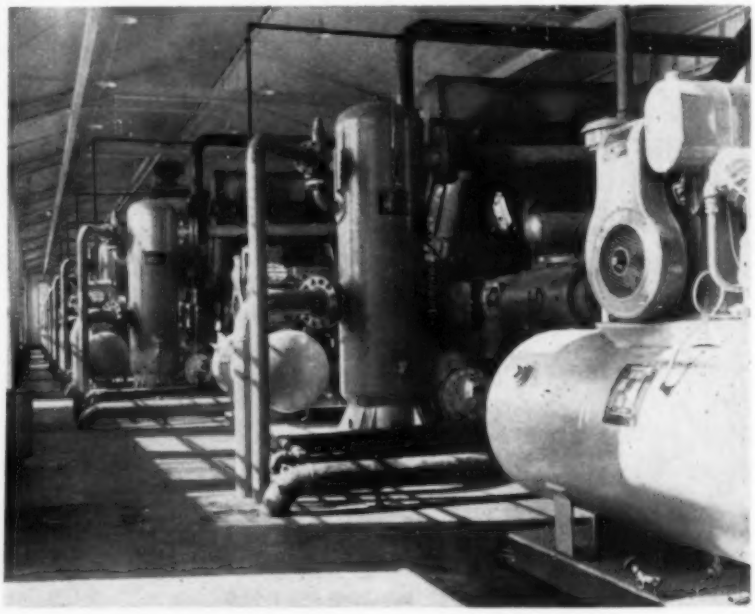
Skid-mounted units have all auxiliaries — save that of electric power — that might be used for lighting and remote controls. Each has two to four gas scrubbers, depending on the number of compressor stages. The units have an air cooling section for jacket water, lube oil and perhaps discharge or interstage gas.

Jacket water pump and atmospheric cooling fan are driven from the engine; and, the control panel mounted on the skid with the engine always contains necessary shutdown controls for overheat, low oil pressure, overspeed and vibration. Additional shutdown controls are available for high gas temperatures, valve breakage, etc. More often than not, the skid contains the starting air compressor and storage bottle.

Field Installation

In many instances packaged units are preferred for low-cost installation. Their concrete slab foundation need furnish nothing more than engine support —all of the units are dynamically balanced. Although most operators prefer some sort of housing for the units and perhaps an overhead traveling crane for maintenance purposes, such

World's largest station of packaged units? Perhaps. It is New York State Natural Gas Company's Renova, Pennsylvania, station which has been in operation since 1951, and it has 11,000 hp — a number of the units are not shown.



Inside New York State's compressor station made up of packaged units. Note the starting air compressors and storage bottles at right. The station has 10—550-hp, 8—440-hp and6—330-hp engines.

Large package compressor unit — note that the engine and cooling section are on the same skid.

additions are not strictly necessary. With a few modifications, any of the units on the market today will withstand ordinary outdoor weather.

Without housing, cost for field installation of, say 550-hp units, runs about $7000 apiece. This is the cost of pouring the slab, hauling the packaged unit to the field, leveling and bolting it down and tying the suction and discharge lines into the field gathering system. Once the slab has been poured, the installation can be completed in a matter of hours.

Unit Cost

Cost of the packaged compressors vary with horsepower, number of stages of compression, number and size of cylinders, gas pressure and locality.

If yard piping —other than suction and discharge leads are ignored the following figures should bracket the cost of almost any packaged unit installed on its foundation and in operation in the field. Allowance is made to include the price of an average galvanized metal building.

240 hp	$240 to $280 per bhp
265 hp	$220 to $260 per bhp
330 hp	$215 to $250 per bhp
400 hp	$210 to $250 per bhp
550 hp	$180 to $220 per bhp
660 hp	$175 to $208 per bhp

A number of companies have bettered some of these prices by holding down installation costs.

Unit Flexibility

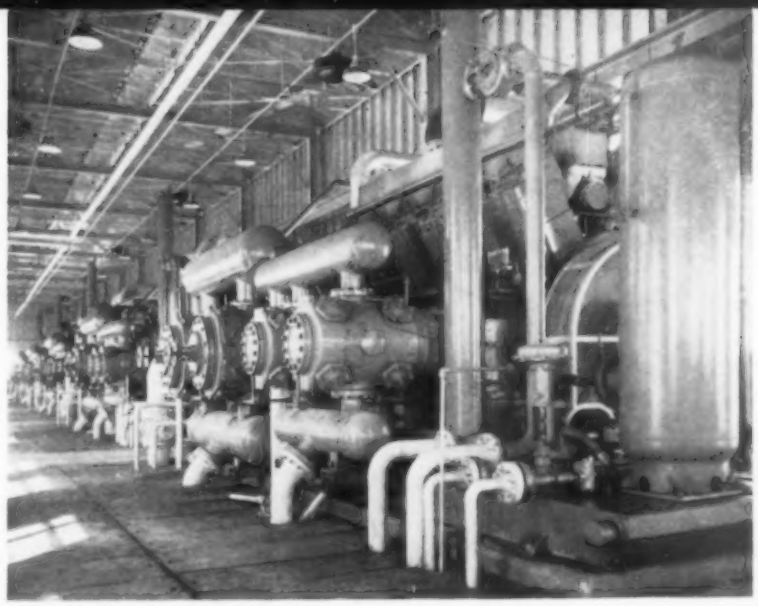
All packaged units have a long life expectancy, and are designed to be moved from field to field at minimum expense. In order for this to be feasible, the units are necessarily easy to modify. The cylinders are inexpensive to change, and there is a great variety of cylinder and liner sizes available. Most of the engines have four or more throws on their crankshafts that can be used for compressor cylinders.

Salvaging

Salvaging a packaged unit is swift and simple. Suction and discharge lines are unbolted at the skid and anchor bolts are removed. The skid (or skids) are hoisted onto a lwo-bed trailer and the unit is on its way to a new location. The only thing left behind is the building and foundation, and often the building can be salvaged, too.

Operating Costs

There are several means of estimating operating costs. Perhaps a good average figure will be something like $22.50 per bhp per year. Here is an estimated breakdown of the charges:



This 3300-hp station of packaged units handles sour gas on the Natural Gas Pipeline Company of America's system. Tht units are skid-mounted and readily moved.

Approximate Operating Costs of Packaged Units.

Fuel (74.46 Mcf of gas per bhp/yr at 10½¢ per Mcf)	$7.81 per bhp/yr
Lube oil (2000 hp-hours per gallon)	3.37 per bhp/yr
Maintenance cost (labor and parts)	4.20 per bhp/yr
Operating labor	6.50 per bhp/yr
Electric power	.27 per bhp/yr
Miscellaneous supplies	.23 per bhp/yr
Automotive	.32 per bhp/yr
Total	$22.50 per bhp/yr

This figure, which does not include the cost of depreciation, is anything but conservative so far as operating maintenance is concerned. Chances are, the labor figure will average something like $1.50 per bhp per yr instead of $6.50 because most of the units operate with little or no attendance.

Applications

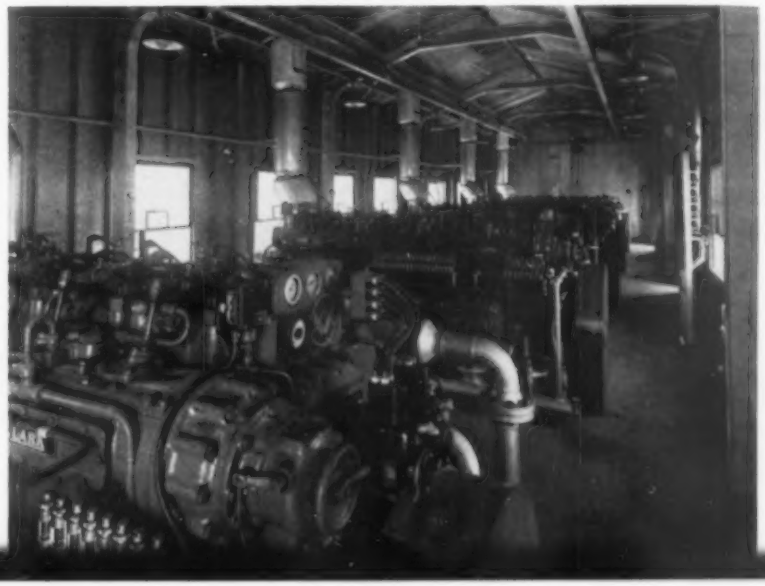
Because of the compactness of the units a ready market is being found in offshore oil operations. Platforms in protected waters cost something like $70 per sq ft. In deep water, cost soars even higher. With space this costly, the more compact the compressor unit the better. Besides, these units are well suited to automatic or remote controlled operation.

Other Field Applications

Marginal oil production is of increasing importance in the U. S. Taken singly, none of the fields are of great importance, but lumped together, stripper wells comprise a vast oil field that will materially affect the reserves of the nation.

In many of these fields, the packaged compressor is playing a key role. In the past, it has been common practice to

Offshore station. Compactness is of great importance on platforms that cost from $70 per sq ft up.



wait until a field has been more-or-less fully developed and the reserves and production history studied before constructing field compressor stations. Think what this means to a marginal field with a five year life expectancy. Even a six month's delay selling the gas means at least a 10 percent overall loss if the gas is being flared. But in actual practice, the loss would probably run much higher, because most wells are fractured or otherwise stimulated during initial completion; and the first six months may account for a large part of the total production.

Because of packaged units, much of this delay has been eliminated. Preliminary estimates of the gas reserves can be made after two or three wells have been drilled, and units ordered on this basis. If too small, others can be added. If units are too large, they can be salvaged, moved to another location and replaced. If the compression ratio need be changed, additional or different compressor cylinders can be added. As production declines in the field, the units can be moved out singly for service in other fields.

Smaller Gathering Systems

Another important factor, so far as marginal or any other type field is concerned, is that the high salvage value of the packaged units enables the operators to be more liberal in their use of compressors in the field. More compressor units can mean smaller lines in the gathering system. Advantage of small high pressure lines over large low pressure ones is readily apparent. It costs something like $2000 per diameter inch per mile to construct a line in most fields, and any reduction in pipeline sizes means considerable savings.

Conclusion

Summed up, advantages of the packaged compressor units are:

1. Cost is low.
2. Salvage value is high.
3. It is readily available and can be installed with little or no delay.
4. It is flexible; and can be used in more than one service.
5. It can be added in convenient increments to follow field production.
6. It is compact and lends itself to unattended operation.

Acknowledgment

The author wishes to thank Southwest Industries, Inc., Houston, Texas; J. B. Beaird Company, Inc., Shreveport, Louisiana, and Clark Bros. Company for their aid in preparing the article. Part of the information and ideas came from a paper delivered by E. C. Mannas, of Continental Oil Company.

★ ★ ★

"Imagineering"...

NEW HORIZONS IN PRODUCTION TECHNOLOGY

Oil field suppliers urged to review, evaluate, accept "best" of modern research

Grover Kilgore
Vice President
Halliburton Oil Well Cementing Company
Duncan, Oklahoma

DOMESTIC and international demands are setting the pace for an accelerated pattern of proved technologies that a few short years hence will make many of the present miracles of petroleum engineering obsolete or less desirable.

The overall industry trend to a better quality of proved performance in exploration and production, will, by its prominence, establish a necessity for all interested companies, both new and established, to create a character of developmental performance. This will necessitate continuous immediate technical reviews of procedures and additions to programs that defy an attitude of standing by, watching and waiting.

Leadership

The scheme of things to come, therefore, makes it mandatory that any company desiring to maintain leadership and contribute even greater benefits, must assume the responsibility for research continuity.

Every working member of the petroleum industry should have an open mind and accept the fresh modern concepts of the new group of young aggressive physicists and engineers — and still retain the proved character of their own responsibility. At the same time, the necessity for utilizing a new technique called "imagineering," or advanced thinking, must be recognized.

New Techniques

The overwhelming volume and weight of new information is almost too much for even the engineer having leisure to comprehend. Therefore, a formula must be designed to translate this material quickly and accurately into immediately usable data. Otherwise, highly advanced new techniques will be understandable to only a select group who have cut their eye teeth on the advanced-paced school of petroleum engineering. But what place do the old line proved techniques have in this picture? Should they be, or must they be discarded? The decision is not so much the customer's but the responsibility of the supplier. It would be well to ask this question: "How prudent would it be for a recognized supplier to advance new theories of technical development without giving consideration to the overall effect on the industry's present proved methods?" And yet the last few years have themselves been an accelerated proving ground for new techniques.

It would appear that the old and the new working in unison could produce a technical world of developments and avoid destroying the proved benefits of the past. The need is so great for a common field of understanding that it overshadows almost all other factors.

Responsibility

The responsibility of leadership is now burdened with not only the penalty of bigness but cognizance of the letdown of many international barriers. Time, distance and speech barriers make it absolutely imperative that each supplier having an international trade relationship develop a medium of universal technical understanding which incorporates the most pertinent of the proved past, adds to it the modern ingredients which, while of an accelerated developmental nature, have surprisingly convinced even the most conservative of their value.

A characteristic of all great industries is to employ the miracle of modern technology to give our American way of life the unique distinction of having "everyday luxuries" as commonplace, therefore, we as working partners in the petroleum industry must demand of ourselves the ability to review, evaluate and accept the best of modern research. With it we must exercise utmost vigilance on behalf of the customer to the end that our efforts produce a minimum of industry conflict.

Acknowledgment

This is the text of a talk given by the author before the PESA meeting held at Houston, Texas, February 4, 1957.

★ ★ ★

Charts and graphs simplify determination of...

Hydraulic Horsepower Requirements For Well Treatments

Robert W. Brown and George H. Neill
The Western Company, Midland, Texas

Use only the pumping equipment needed for a specific job and keep treating costs down. But, you need to know what pump horsepower is required. This method is rapid and reasonably accurate

A rapid and reasonably accurate method has been devised to calculate hydraulic horsepower required to meet a specified injection rate on a well treatment to acidize or fracture formations. This method, combined with practical experience in the area concerned, will give an accurate means for determining the number and types of pumping units, and in some cases the type of fluid best suited for the required conditions of treatment.

Since the advent of high injection rate fracturing and acidizing treatments, hydraulic horsepower required to meet a specified injection rate has become an important factor in planning well treatments. An accurate knowledge of the hydraulic horsepower requirements is necessary to determine the minimum number of pumping units that can fulfill the job specifications.

Aside from the desired injection rate, three basic pressure values must be determined or estimated in making a horsepower calculation. These values are (1) friction loss, (2) hydrostatic head, and (3) bottom-hole injection pressure.

Friction loss. Pressure loss due to friction is a function of treating fluid properties and physical properties involved in the treatment, such as flow rate, inside diameter of the treating string, and depth of the well. Fluid properties that must be considered are: Density, solids content, and viscosity.

By far the most important of these properties is the effective viscosity of the treating fluid. Other properties can be measured by relatively simple means. But, since the effective viscosity of many well treating fluids varies with the rate of shear (i.e., fluid velocity), an accurate measurement of the viscosity can be rather complicated.

To obtain an accurate value, viscosity of the treating fluid should be measured at the shear rate which is to be expected during the treatment. This is impractical because fluid velocities during most well treatments range from 5 to 50 ft per second. These velocities are beyond the limits of shear for most viscosimeters.

A previous study[1] has shown that a logarithmic plot of viscosity vs shear rate yields a straight line and from this curve the effective viscosity of the treating fluid may be determined corresponding to any desired shear rate. Upon this basis, measurements of viscosity can be made at several rates of shear with a viscosimeter and plotted on a logarithmic chart. Fig. 1 shows an example of this type plot for an acid-kerosine emulsion extrapolated so that the viscosity may be determined at the various injection rates or rates of shear in 5½-in. 15½-lb casing.

This method, at best, is time consuming, but is the best known for emulsions. Fortunately, however, simpler methods can be used for measuring effective viscosities of other treating fluids. These fluids include gels, refined oils, crude oils, acid, and water.

TABLE A—Viscosity Correction Factors for Sand-Laden Fluids

C_v	n_F
1.0	1.1
1.5	1.2
2.0	1.25
2.5	1.6
3.0	1.75
3.5	1.95
4.0	2.15
5.0	2.75

Correction factor n_F used to convert effective viscosity μ (in centipoises) of fracturing fluid to viscosity of sand-laden fluid μ_s in the following expression: $\mu_s = n_F \mu$

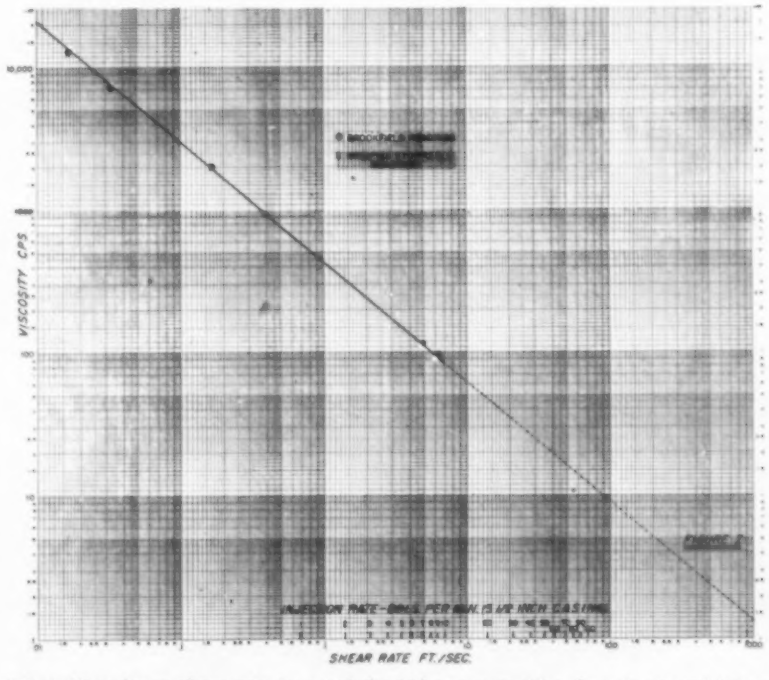
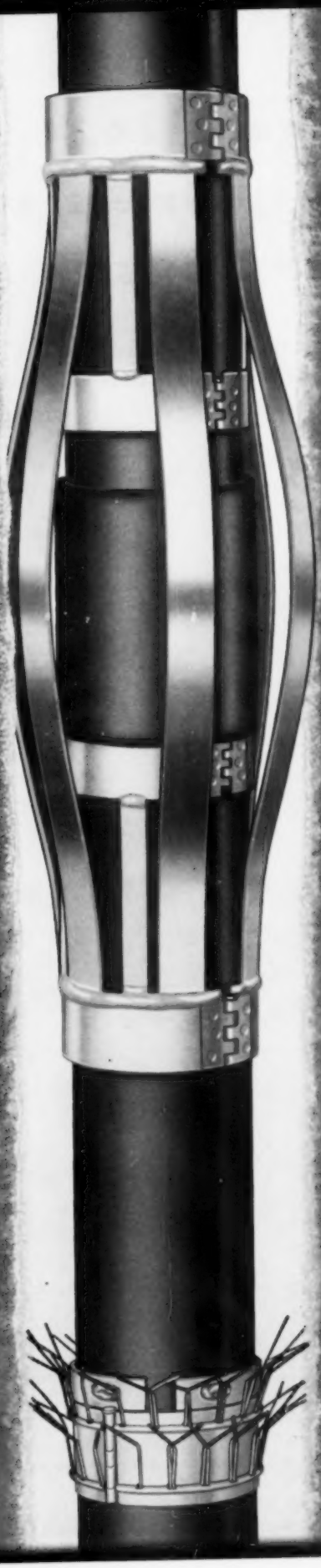


FIG. 1. **Viscosity vs shear rate** for a typical acid-kerosene emulsion. Curve is extrapolated so that viscosity may be determined at various injection rates or rates of shear in 5½-in. 15½ lb casing.



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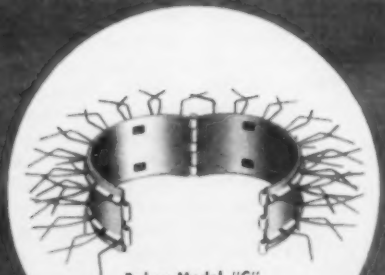
Here's that



Baker Model "C"
HINGE-LOK Wall Scratcher
Product No. 900-C
25 Range

Baker Model "C"
SOLID RING Wall Scratcher
Product No. 901-C
25 Range

For successful "first-time" cementing use the combination of BAKER CASING CENTRALIZERS to ensure ample clearance for placing a uniform body of cement around the casing—and BAKER WALL SCRATCHERS to scratch away the mud cake so that the cement will bond better with the exposed formation.

YOU MUST HAVE "EFFECTIVE CENTERING FORCE"

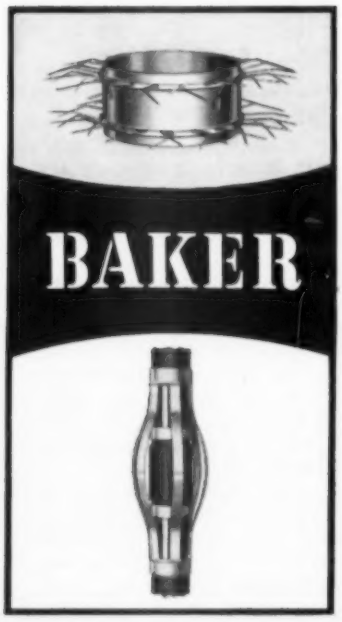
Baker Casing Centralizers have that *balanced combination* of proper spring *length* and proper *bowed height* ("reach") to provide Effective Centering Force *throughout the area to be cemented.* And, because each spring is pre-tested and pre-set in hydraulic presses, you have this Centering Force *at the cementing point,* regardless of depth or of "dog legs" in the hole.

YOU SCRATCH ONLY THE SECTIONS TO BE CEMENTED

Baker Wall Scratchers perform a "controlled" scratching job, because the wires remain close against the casing while running in the hole, and *do not damage the vital filter cake* built up on sections through which the scratchers pass. Only when the "wall scratching" operation is started, do the overlapping wires (positioned in a *double* shell) *really go to work* scratching away the mud sheath and exposing the formation for far better bonding of the cement.

OUTSTANDING COMBINATION

FOR BETTER PRIMARY CEMENTING



Baker Wall Scratchers also meet your specific needs because they are available with either 4½-inch long scratcher wires, or with 2½-inch long wires. You can also select either the HINGE-LOK Type which is hinged for easy mounting, or the SOLID RING Type which is *slipped over the casing.*

Contact the Baker representative in your area and get complete details about these Baker aids to better cementing. He has first-hand field knowledge that will prove valuable to you.

WALL SCRATCHERS

CASING CENTRALIZERS

You can choose Baker Casing Centralizers exactly suited to each cementing job because they are available with various bowed heights of the springs to meet different casing programs—and there is the Baker Model "H" HINGE-LOK Type which is hinged for easy mounting, or Baker Model "G" SOLID Type which is merely slipped over the casing.

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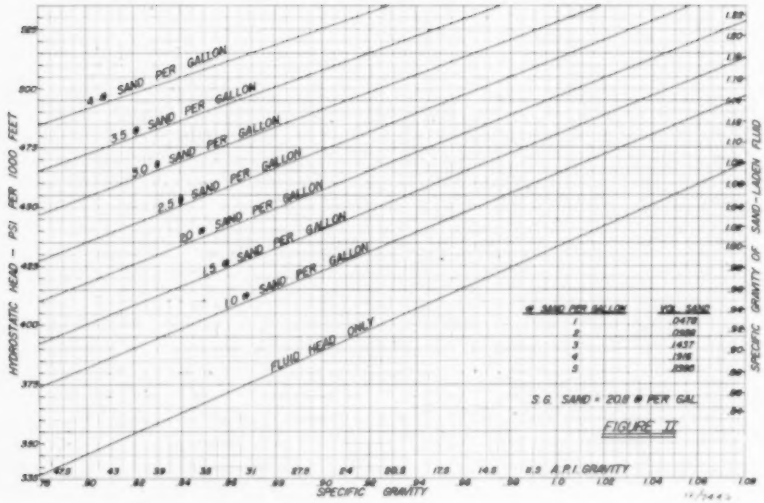
HYDROSTATIC HEAD - PSI PER 1000 FEET
SPECIFIC GRAVITY OF SAND-LADEN FLUID
4 # SAND PER GALLON
3.5 # SAND PER GALLON
3 # SAND PER GALLON
2.5 # SAND PER GALLON
2 # SAND PER GALLON
1.5 # SAND PER GALLON
1 # SAND PER GALLON
FLUID HEAD ONLY
SAND PER GALLON
VOL. SAND
S.G. SAND = 20.8 # PER GAL
FIGURE II
A.P.I. GRAVITY
SPECIFIC GRAVITY

FIG. 2. **Density of sand-laden fluid** is determined when density of the fluid and sand concentration is known.

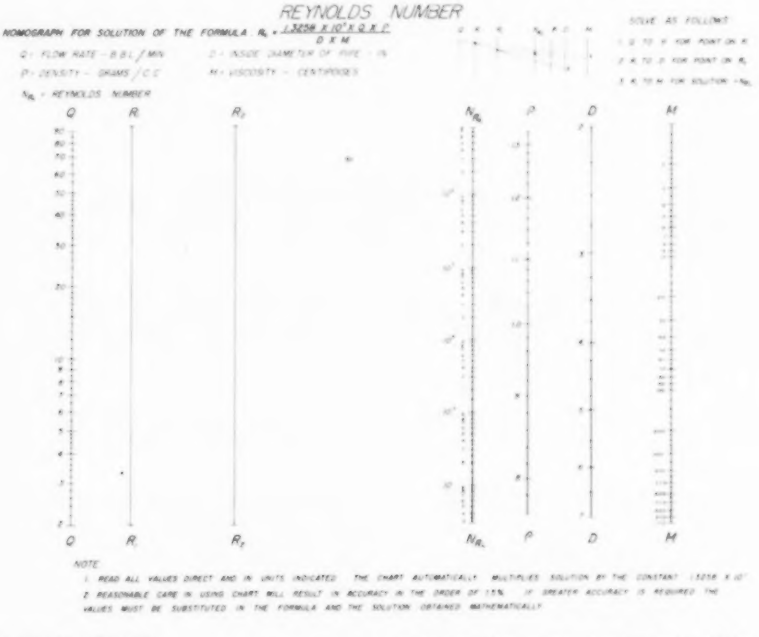
REYNOLDS NUMBER
NOMOGRAPH FOR SOLUTION OF THE FORMULA
Q = FLOW RATE - B.B.L./MIN.
D = INSIDE DIAMETER OF PIPE - IN.
P = DENSITY - GRAMS / C.C.
M = VISCOSITY - CENTIPOISES
= REYNOLDS NUMBER
SOLVE AS FOLLOWS
FOR POINT ON
FOR SOLUTION
Q
D
P
M
NOTE
1. READ ALL VALUES DIRECT AND IN UNITS INDICATED. THE CHART AUTOMATICALLY MULTIPLIES SOLUTION BY THE CONSTANT 1.3256 X 10
2. REASONABLE CARE IN USING CHART WILL RESULT IN ACCURACY IN THE ORDER OF 1.5%. IF GREATER ACCURACY IS REQUIRED THE VALUES MUST BE SUBSTITUTED IN THE FORMULA AND THE SOLUTION OBTAINED MATHEMATICALLY.

FIG. 3. **How to obtain Reynolds number** from nomograph, when flow rate in barrels per minute, density of frac fluid in grams per cubic centimeter, pipe inside diameter in inches and viscosity in centipoises are known.

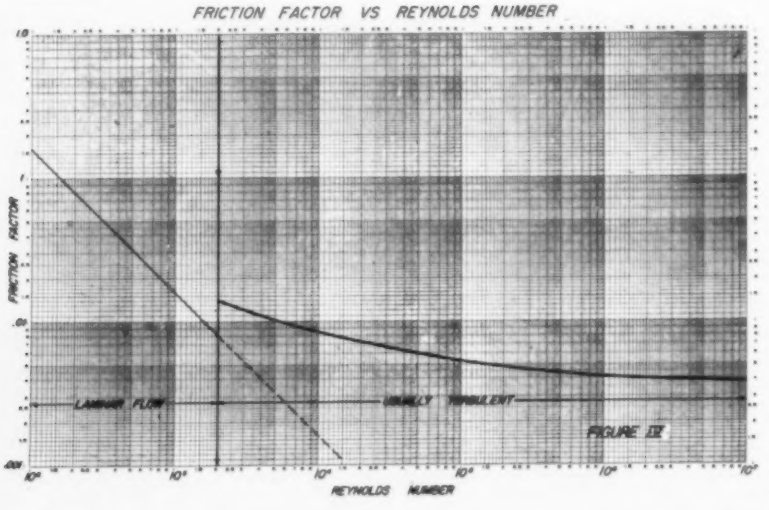

FIG. 4. **Friction factor f** corresponding to Reynolds number is obtained from the above relationship.

At high rates of shear normally encountered in well treatments, effective viscosity of a gel, either water or oil base, approaches the viscosity of the base fluid. For practical purposes, the effective viscosity can be considered equivalent to that viscosity. A simple viscosity measurement of the fluid to be gelled will give a satisfactory viscosity value.

Refined oils at temperatures above approximately 100 F behave as Newtonian fluids. Below 100 F their behavior is usually non-Newtonian. This phenomenon can be explained by the fact that, with a decrease in temperature, dissolved paraffins, asphalts, etc., become less soluble and tend to "fall out" as suspended particles that contribute to the non-Newtonian properties. This deviation from Newtonian behavior, however, is relatively slight and can be neglected in most cases.

Since the viscosity of refined oils decreases rapidly with increases in temperature, the viscosity measurement should be taken at the effective downhole temperature which will be expected during the treatment. In most cases, an average of the surface temperature and the bottom-hole temperature of the well to be treated will suffice as a satisfactory estimate for the average temperature of the fluid during treatment.

Crude oil, hydrochloric acid, and water behave as Newtonian fluids, and viscosity measurements of these fluids can be made accurately with any suitable instrument.

Hydrostatic head: Hydrostatic head, or the pressure exerted by the fluid in

Here a 94-belt hp, 24,800-lb. HD-11 dozes out a slush pit. By pulling one lever, operator can shift from any of the six forward speeds to any of the three reverses. By using the high-speed reverse, he can back up in a hurry—convert maneuvering time to production time.

Allis-Chalmers dozers hog dirt out quick on oil field jobs

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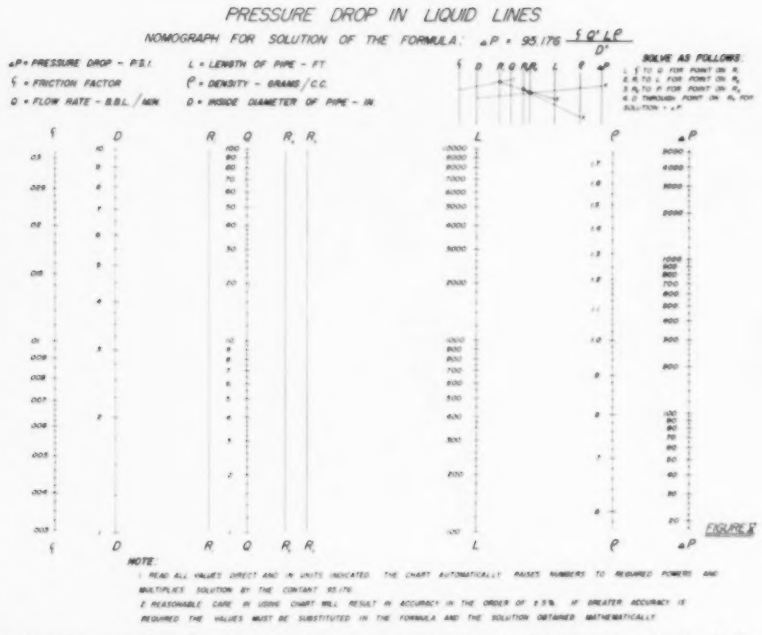
PRESSURE DROP IN LIQUID LINES
NOMOGRAPH FOR SOLUTION OF THE FORMULA: ΔP = 95.176 f Q² L ρ / D⁵
ΔP = PRESSURE DROP - P.S.I.
f = FRICTION FACTOR
Q = FLOW RATE - B.B.L. / MIN.
L = LENGTH OF PIPE - FT.
ρ = DENSITY - GRAMS / C.C.
D = INSIDE DIAMETER OF PIPE - IN.
SOLVE AS FOLLOWS
f D R Q R R L ρ ΔP
f D R Q R R L ρ ΔP
FIGURE 5
NOTE:
1. READ ALL VALUES DIRECT AND IN UNITS INDICATED. THE CHART AUTOMATICALLY RAISES NUMBERS TO REQUIRED POWERS AND MULTIPLIES SOLUTION BY THE CONSTANT 95.176.
2. REASONABLE CARE IN USING CHART WILL RESULT IN ACCURACY IN THE ORDER OF 2.5%. IF GREATER ACCURACY IS REQUIRED THE VALUES MUST BE SUBSTITUTED IN THE FORMULA AND THE SOLUTION OBTAINED MATHEMATICALLY.

FIG. 5. **Pressure drop in pipe** determined from nomograph when friction factor, length of pipe (depth), flow rate in barrels per minute, and density of treating fluid in grams per cubic centimeter are known.

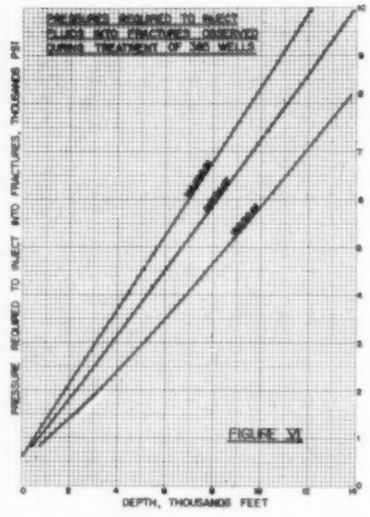
PRESSURE REQUIRED TO INJECT FLUIDS INTO FRACTURES, OBSERVED DURING TREATMENT OF 385 WELLS
PRESSURE REQUIRED TO INJECT INTO FRACTURES, THOUSANDS PSI
DEPTH, THOUSANDS FEET
FIGURE VI

FIG. 6. **Bottom-hole injection pressure** to pump into fractures may be obtained from these curves based on observations in treating 385 wells.

the treating string, is simply a function of three variables: Density of the treating fluid, its solids content, and depth of the well. Each of these variables can be readily determined or estimated.

Bottom-Hole Injection Pressure

Bottom-hole injection pressure is that pressure which the formation in the well will accept the flow of fluids and sand through fractures or other flow channels.

It normally might be expected that this bottom-hole injection pressure would vary considerably with changes in pumping rates, but actual experience has shown that the bottom-hole injection pressure usually remains relatively constant for a particular formation regardless of the pumping rate or type of fluid. An increase in injection rate has been known to cause an increase in the bottom-hole pressure, but the duration of this increase was short because of the subsequent breaking down of additional zones, after which the bottom-hole pressure returned to the original injection pressure. (In perforated wells the friction drop across the perforations must be added to the bottom-hole injection pressure in the well bore to determine the desired surface pressure. This restriction applies only when this friction drop is significant.)

From previous treatments, a statistical curve for the bottom-hole injection pressures relative to depth has been developed as shown in Fig. 6. It is readily observed from this curve that the dif-

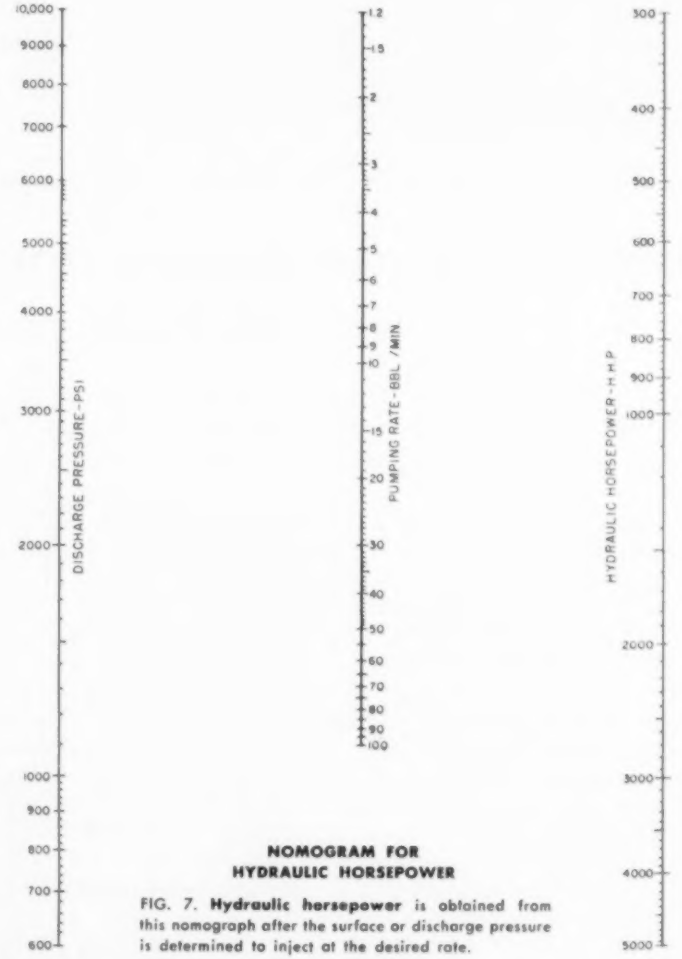

FIG. 7. **Hydraulic horsepower** is obtained from this nomograph after the surface or discharge pressure is determined to inject at the desired rate.

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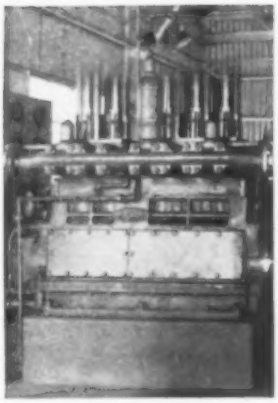

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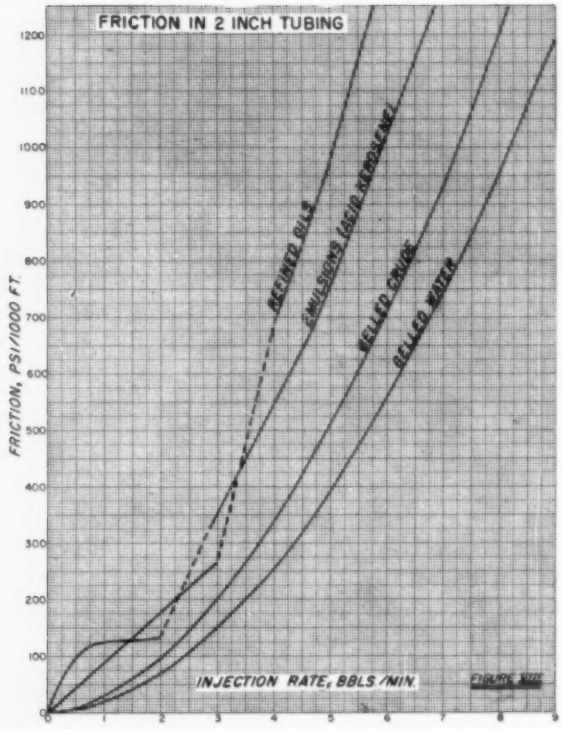
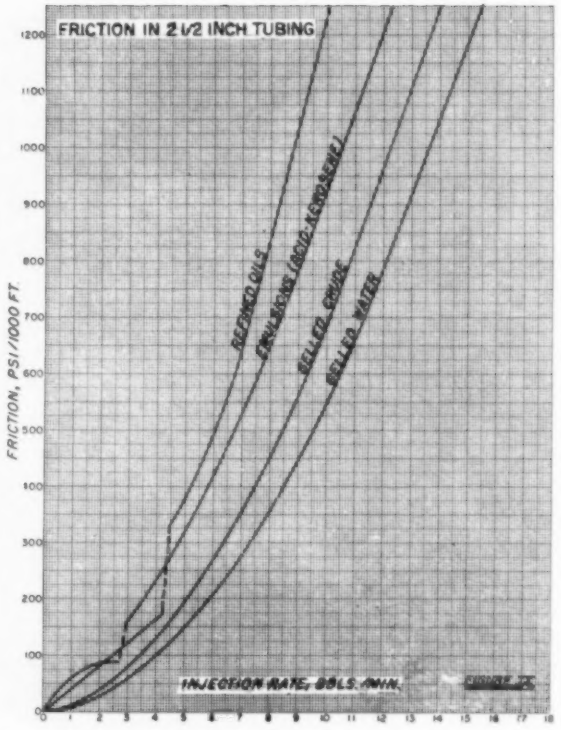
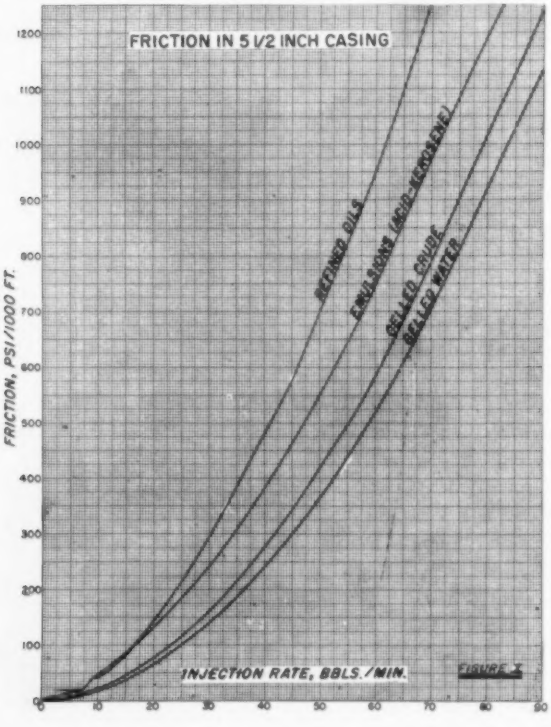
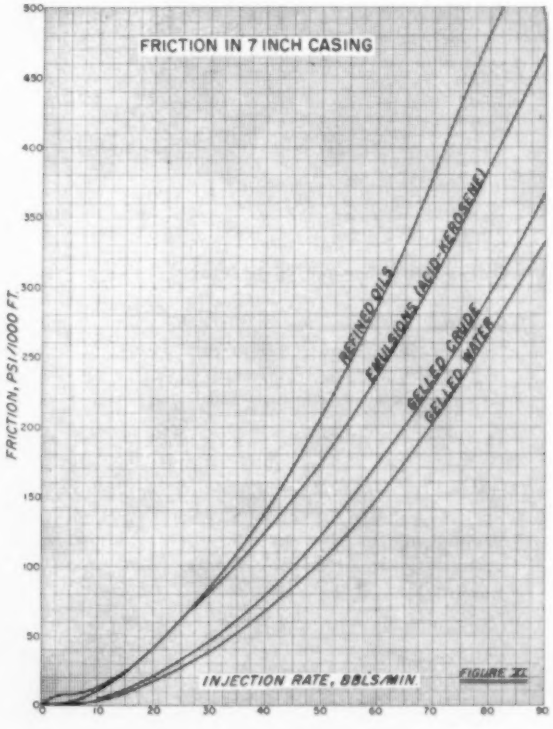




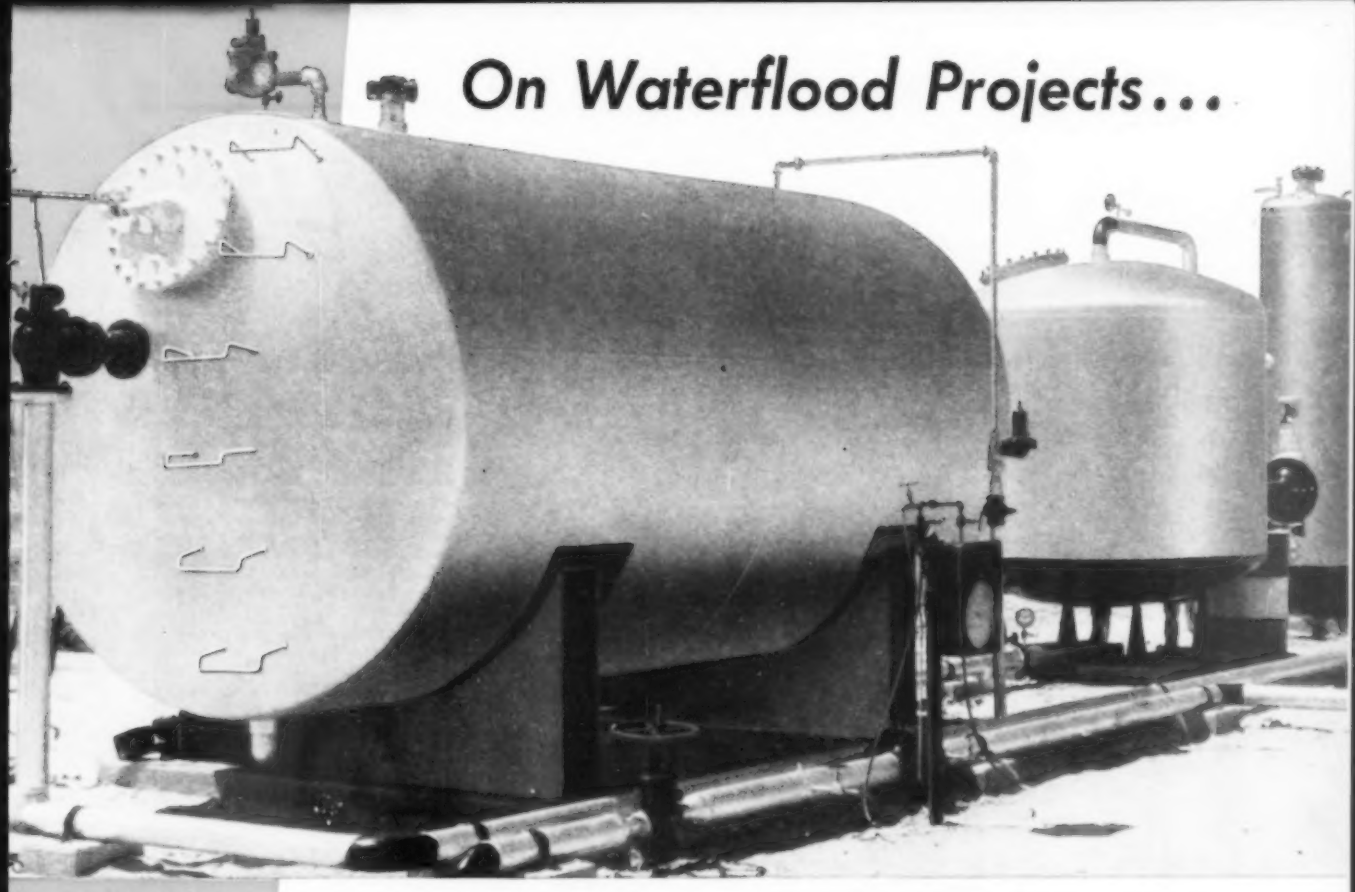
FRICTION LOSS CHARTS. All friction loss curves shown in Figs. 8, 9, 10 and 11 have been calculated for a sand content of two pounds per gallon for the various types of fracturing fluids and different sizes of tubing and casing. A correction of about eight percent should be made for each pound per gallon deviation from two pounds per gallon. If only one pound of sand per gallon is used, reduce the determined indicated friction factor on these charts by eight percent; if three pounds per gallon, increase indicated friction factor indicated by eight percent.

Although some accuracy may be sacrificed, determination of hydraulic horsepower requirements can be simplified further by using values of the friction loss taken from these charts rather than proceeding through the more complicated calculation of these values.





On Waterflood Projects...



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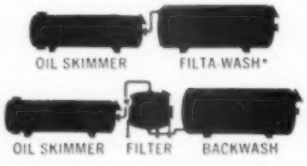

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ference between the minimum and maximum injection pressures at a particular depth may approximate 2000 psi. This difference is a function of the varying physical characteristics of the exposed formations from locale to locale. Of these varying properties, the permeability is the most important. If the formation to be treated is relatively permeable, the injection pressure should be determined at some point between the average and minimum curve. If the formation is relatively tight, the injection pressures should be evaluated at a point between the average and maximum curves. There is still a fairly wide range of values in either case, but the induced error is not sufficient in most cases to affect the horsepower allocations.

Step-Wise Procedure

1. Assemble the following data relative to the treatment: Q, specified injection rate, bbl per minute; D, inside diameter of treating string, in.; L, length of treating string, ft; ρ, density of treating fluid, grams per cc; μ, effective viscosity of treating fluid, cp; and C_0, sand content, lb per gal.

2. If the treating fluid is sand laden, correct its density, ρ, to ρ_s from Fig. 2.

3. Correct the effective viscosity, μ, of the fluid (if sand laden to μ_s as follows: a. From Table 1, determine n_r; and b. determine μ_s from the relationship: $\mu s = n_r \mu$.

4. From the nomograph of Fig. 3, determine the Reynold's Number, N_{Re}.

5. From Fig. 4, determine the friction factor, f, to correspond to the value of N_{Re}.

6. Use this value of f in the nomograph of Fig. 5 to determine the friction loss, $\Delta\rho$.

7. Determine the hydrostatic head, H, from Fig. 2.

8. Select a value for the bottomhole injection pressure, P_{BHI}, from Fig. 6. If a more accurate value is available through data from previous treatments within an area, use this value of P_{BHI}.

9. Determine the surface pressure, P_s, from the relationship: $P_s = P_{BHI} + \Delta\rho - H$.

10. From the nomograph of Fig. 7, determine the hydraulic horsepower which will be required to meet the specified injection rate.

Acknowledgment

The authors wish to express their appreciation to the various divisions of The Western Company for their assistance in the preparation of this paper and to the management of The Western Company for permission to publish these findings.

References

1. Brown, Robert Wade, "How to Calculate Friction Losses During Well Treatments," *The Petroleum Engineer*, October, 1956, p. B-123.

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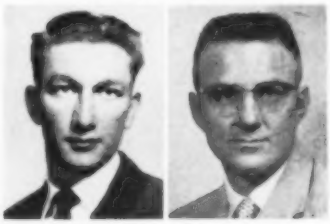
The Authors



R. W. Brown G. H. Neill

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George H. Neill is a group leader in the Chemical Engineering Department of The Western Company at Midland, Texas, in charge of the blocking and fracturing research. He joined The Western Company in 1951 after graduation from The University of Texas where in 1950 he was awarded a BS degree in petroleum engineering.

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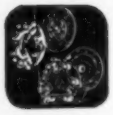

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Principles and Practices of . . .

CEMENTING

Casing and cementing operations constitute 20 to 30 percent of a well's cost. Good practices are essential to satisfactory completion and result in optimum production conditions throughout the operating life of the well.

D. F. Jahns
Shell Oil Company
Odessa, Texas

THE subject of cementation is, of necessity, closely related to the varied completion techniques and different pay zones encountered in the drilling and completion of oil wells. Casing is a major expense in drilling, and a casing job is only as good as the cement job which forms the bond between casing and formation, fills the desired annular volume, and provides a permanent seal.

Much development work has been performed in recent years to improve both materials and techniques used in cementing operations. Continued advances are anticipated through efforts of operating companies and the cementing companies who are contracted to provide the desired services. The information provided here is a condensed summary of much of the literature together with some of the particular techniques used in the industry.

Purposes of Oil Well Cementing

Drilling costs vary widely because of varying completion depths, drilling programs, and location problems. Excluding offshore locations, the casing and cementing of an oil well accounts for approximately 20 to 30 percent of the total drilling costs.

In an oil well, casing and cement are used primarily to line the bore hole in a manner which will eliminate the difficulties that would be experienced if the formations were in continuous communication with drilling or produced fluids. Casing a well eliminates the problems of sloughing shales, solution of salt sections, fluid migration to low pressure zones, high pressure flows into the bore, and potable water contamination. With these problems in mind, operators select a string of tubular goods of sufficient strength, hang it from the surface or from a previously run string of casing, and fill the annular space between the casing and formations with a suitable cementing material. Frequently, for reasons of economy, the annulus is not cemented to the surface.

In summary, casing cementation is performed:

- To preclude migration of water, oil, or gas from one formation to another,
- To eliminate the contact of well fluids with unstable or soluble formations,
- To control troublesome high or low-pressure zones encountered in drilling,
- To protect the casing from corrosive waters,
- To prevent contamination of potable water.

Sub-Surface Conditions

The environment to which a cement is subjected will determine largely its selection. The problem of material selection is two-fold in that a cement slurry must remain fluid until placed and then it should set as quickly as possible. The two sub-surface features which determine the pumping and setting time of a given slurry are temperature and pressure. Of these, temperature has the more pronounced effect. Sub-surface pressure cannot be overlooked, however, because the slurry selected must provide a hydrostatic pressure greater than bottom-hole formation pressure.

Temperature

The estimate of bottom-hole temperature at a given location can be made from data gathered from oil well drilling operations over wide areas of the United States. The geothermal gradient in any given locality is fairly constant and is only locally altered by conditions of an unusual nature. The normal gradient approximates 1 F for each 100 ft of depth; variations occurring in some localities.

The method for estimating the bottom-hole temperature to be expected in a given well is as follows:

Gulf Coast Wells:

Bottom-hole temperature,

$$\text{deg F} = 80 + 0.015 \times \text{depth in feet}$$

Mid-Continent Wells:

Bottom-hole temperature,

$$\text{deg F} = 74 + 0.01 \times \text{depth in feet}$$

Pressure

An estimate of subsurface pressure can be made if the hydrostatic gradient is known. In general, bottom-hole pressure along the Gulf Coast of Texas and Louisiana increases 0.465 psi per ft of depth, based upon a hydrostatic pressure of a column of water containing 80,000 ppm solids. Wells in the Rocky Mountains and Mid-Continent areas generally are found to have a normal pressure gradient of 0.433 psi per ft of depth. Extreme pressures have been encountered along the Gulf Coast where the maximum pressure gradient approaches 0.900 psi per ft of depth in some localities. Low pressure and lost circulation zones often dictate the pressure gradient that can be sustained by a well and, therefore, indicate the permissible cement slurry weight. Ideally, of course, the selected cementing material would have a density equal to that of the drilling mud which is sufficient to contain the well fluids, but not heavy enough to enter the formations.

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Oil Well Slurries

There are infinite combinations of cementing materials, additives, and mixing waters to yield various values of thickening time, slurry weight, 24, 48, and 72 hr compressive strengths, perforating and formation blocking characteristics. *For most work*, however, *several types of slurries can be used* and the selection of the particular material will depend upon cost, availability and experience.

Neat Portland

Cement and water suspensions can be used for much of the casing cementation. Several types of Portland slurries are available which present a moderate range of thickening times and 24-hr strengths. Slurry weight can be varied by changing the water to cement ratio within rather well-defined limits.

Thickening time. Thickening time is perhaps the most important property of any slurry. By this is meant the interval elapsed from when mixing commences until the slurry is no longer pumpable. The variables that govern pumpability are chemical composition of the slurry, grind, bore temperature, and pressure. For a given job, of course, temperature and pressure cannot be altered and attention must be focused upon the slurry.

A satisfactory solution to the problem of inadequate thickening time is often found in retarded and slow set cements. These cements have early (24 hr) strengths that are less than ordinary Portland slurries, but they do have longer thickening times. Coarse grinding and high iron content or organic additives account for the peculiar properties of these materials. The most common organic retarder (sometimes called a dispersant) is calcium lignosulfonate, a by-product of pulp paper manufacture. Commercially obtainable under the trade names of Kembreak, HR-4, Lignicite, etc., it is added in quantities varying from 0.2 percent to 1.5 percent by weight of dry ingredients and provides sufficient retardation for the moderately deep (8000 to 15,000-ft) wells. Modified starch is added to some retarded or slow set cements with results similar to those obtained with sulfonate.

There are many other materials that produce retardation, but quite often the dispersing agent loses or reverses its effect at high temperature. Sufficient retarder or other foreign material can be added to a Portland slurry to preclude setting and for that reason the cementer should be fully cognizant of bore-hole temperature, type of cement, slurry mixing water, etc.

Twenty-four-hour compressive strength. Occasionally there are cases where accelerated setting time (high early strength) is desirable. This characteristic can be obtained from high early strength Portland and also by the addition of calcium chloride, in quantities of from 2 to 4 percent, to construction cement (standard Portland). Additions in excess of this reduce 24-hr strength. Commercially prepared high early strength cement is produced by altering the proportions of the fusion products and by finer grinding. In cold climates calcium chloride is often added to mixing water to prevent freezing. The thickening time reduction is in this case somewhat off-set by the fact that cold mixing water gives a longer pumpability.

Slurry weight. The specific weight of a slurry is important for the same reason that mud weight is a major concern. If weights are too high, lost circulation may result and conversely, if they are too low a well might start to kick. Neat Portland slurries range in weight from about 15 lb per gal to 17 lb per gal, depending upon the type of cement and the amount of water used. The limits are set by settling tendencies and pumpability, respectively. Water content regulates density and set properties — 26 percent water being the minimum necessary for complete hydration and 46 percent provides the lightest slurry possible for neat cement. Usual practice is 38 to 46 percent water. In order to obtain lighter slurries, and equally important, less expensive slurries (more volume per sack of cement), "bulk" additives are introduced. In addition to bentonite there are perlite, pozzolan, and others as discussed in subsequent sections.

Weighted slurries may be necessary in those oil provinces where high-pressure wells are encountered. The use of minimum water in conjunction with slow set cement will provide a slurry weighing 17 lb per gal to 18 lb per gal with a pumping time up to 100 min in a 14,000-ft well. In rare instances, it may be necessary to increase the weight of the slurry. Barites or other weighting material can be added to bring the slurry weight up to 19 lb per gal to 22 lb per gal.

Gel cements. For some time, small amounts of bentonite have been added to cements to improve the consistency of cement slurries. Such gel cements produce stable slurries weighing about 14 lb per gal and developing 24-hr compressive strength of 700 to 1200 psi. In recent years, laboratory and field testing have shown gel cements containing 4 to 12 percent bentonite to offer several distinct advantages over regular Portland cement.

Ordinary construction cement, when mixed with a minimum amount of water (16.8 lb per gal slurry), has a thickening time of about 70 min in an 8000-ft well. If the water/cement ratio is increased to the maximum (15.4 lb per gal slurry), all else equal, the thickening time can be doubled. This is about the limit for this type of cement, since a further increase in the water/cement ratio will cause Portland particles to settle out. Bentonite can be added to prevent the precipitation of cement, but until a content of 12 percent bentonite is reached (12.5 lb per gal slurry) there is a reduction in thickening time (compared with 15.4 lb per gal neat slurry). Beyond 12 percent

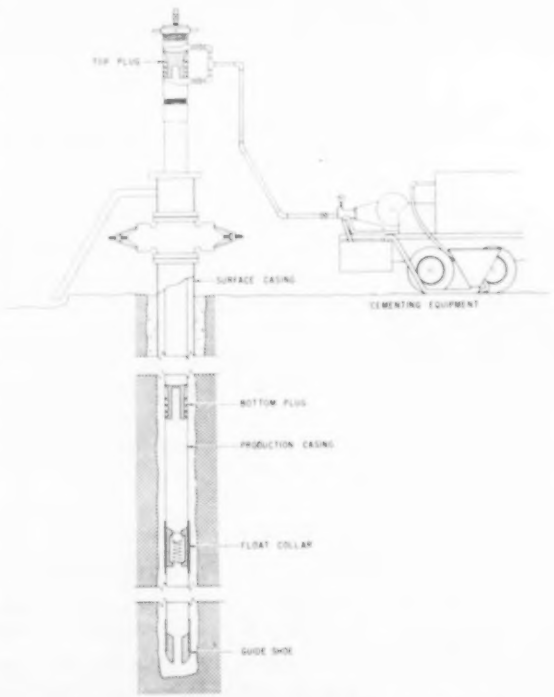

FIG. 1. Normal well set up for cementing operations. Line between cementing head and truck is normally 2 in. equipped with swing joints and quick couplings.

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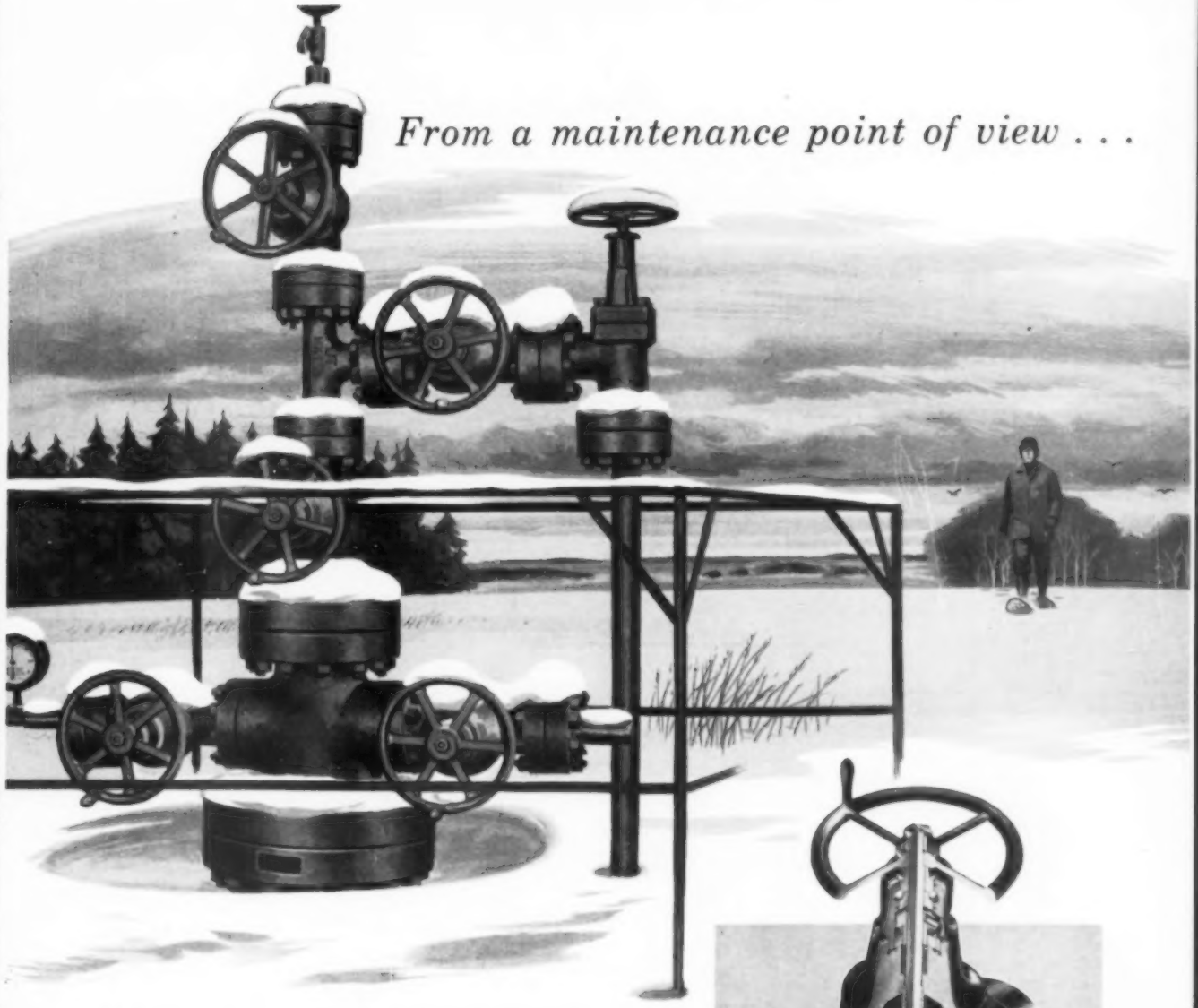
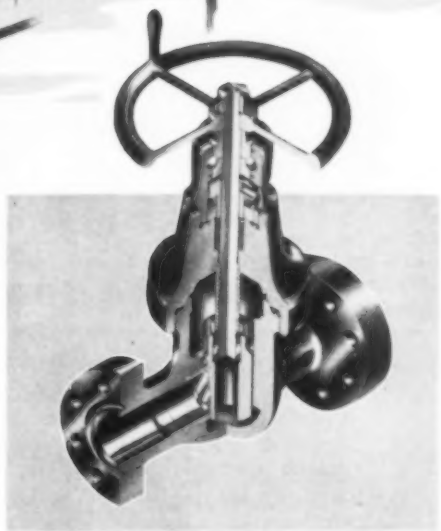
From a maintenance point of view . . .





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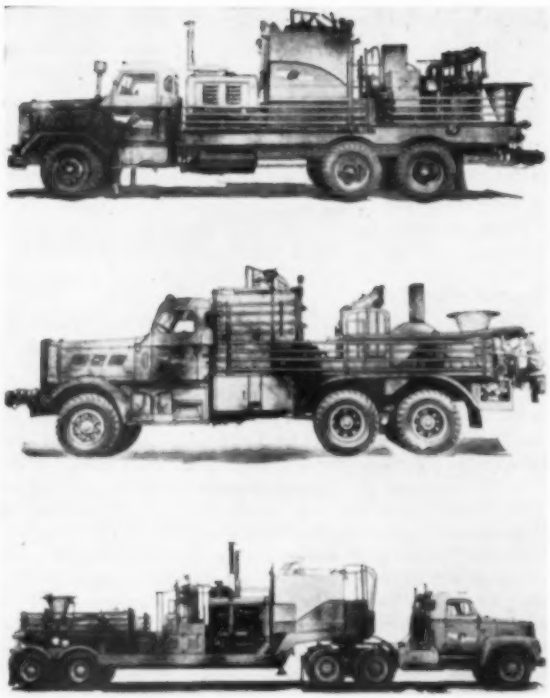

FIG. 2. Typical oilfield cementing trucks. Top unit can mix and displace 25 sacks per minute. Middle unit is rated at 40 sacks per minute and can pump against pressures 10,000 psi. Large trailer mounted unit is equipped with two triplex pumps rated at 10,000 psi. Displacement capacity is 40 sacks per minute.

there is an increase.

Gel cements are widely used in the industry today. The primary considerations in their use are (1) lower slurry density, (2) lower water loss, (3) improved perforating qualities, and (4) lower set strength.

Gypsum cement. Where a temporary plug is needed, fast setting gypsum cement can be used. This material differs from the gypsum used for construction in that it is semi-hydrated to achieve a controlled set at temperatures up to 180 F. One disadvantage of gypsum is that it is water-soluble after setting and for that reason is generally restricted to temporary applications. Gypsum cement is used in oil wells primarily because of its high early strength (2500 psi compressive strength within 1 hour of setting) or because of its tendency to swell as it hardens.

A combination of gypsum cement and water-soluble resin is available to the industry. It has the linear expansion of gypsum cement and high early strength, but is not water-soluble after setting. Principle application of this slurry has been to permanent plugs for water shut-off.

Resin cement. By the proper combination of synthetic resins, water and Portland cement, a resin cement slurry can be prepared for use in oil or gas wells. This product can be furnished in both high and low temperature mixtures. Resin cement slurries are similar in appearance to neat cement slurries. They weigh approximately 14 lb per gal and may be handled in the same manner as neat cement except that it is necessary to mix the resin with water and use this fluid in turn to mix the cement. Under pressure, a filter cake of cement particles compacted with a small amount of resin is formed on the surface of the well bore similar to mud cake deposited during drilling. This filter cake limits the depth of penetration of resin cement into the formation to some extent. Resin cement has been found to be effective for setting liners on initial completion and for squeeze work.

Perlites. In addition to bentonite discussed above, perlites have been widely used in the industry. Perlite is an expanded (popped) volcanic rock. When mixed in a Portland slurry, perlite tends to float and for that reason is generally mixed with 2 to 6 percent bentonite which "holds" the material and gives a more even distribution of the aggregate. Because of the size of the aggregate (about as large as a match head) this type slurry is sometimes used to block fissures in lost circulation zones. A low density slurry, 12 to 13 lb per gal, can be obtained which provides light weight combined with a bridging material.

Pozzolans. Portland mixed with pozzolanic material in proportions ranging up to 75 percent pozzolan can be used where a moderate weight slurry and reduced 24-hr compressive strength are acceptable. These mixtures may be retarded or accelerated. Bentonite, added in quantities exceeding 2 percent, results in very low compressive strengths. If filler material is all that is desired, bentonite up to 8 percent may be used. The principal advantage in using bentonite is that it yields a slightly lighter and considerably smoother slurry with increased pumpability.

Diacel systems. Cements have been developed containing special additives that reduce the water loss. These cements may be useful for some squeeze applications, as well as in casing cementation where low-water loss and/or light weight are important.

In special cases the fluid loss characteristics of cement may cause serious troubles, such as stuck pipe while cementing. Neat cement has an extremely high fluid loss and under certain conditions, such as high permeability pay, high pressures, etc., cement may dehydrate and leave a thick filter cake on the bore wall and stick the casing ("flash set"). Where these conditions are prevalent, special low water loss and low density cements can be used. A recently developed cement of this type utilizes two special additives to Portland cements: Carboxymethyl cellulose (CMHEC) and a special grade diatomaceous earth (DE). This type of cement is termed a "Diacel Cement System." The CMHEC is used for controlling water loss and retarding thickening time while the DE permits the use of high percentages of water in the cement to obtain low density slurries. Water losses as low as 11 ml per 30 min are claimed as compared with 400 to 1000 ml per 30 min for neat cements. (Retarded gel cements may be mixed with a water loss as low as 100 ml.) Densities as low as 10.7 lb per gal can be produced.

Cementing Equipment

Bulk Handling Equipment

Bulk cement equipment is available in the oil industry today to handle dry cement mechanically from rail car to well site for oil well cementation. When ordered from the service company, Portland cement delivered to a well represents 94 lb of cement per sack (one cubic foot).

From the manufacturing plant, bulk cement is transported by rail car to bulk plants in the oil fields. Here the cement is unloaded into steel storage bins or weatherproof tank convoys for movement to a well site. Many bulk cement plants are equipped with volumetric variable speed proportioners to permit mixing any desired amount of bentonite or other additives with the cement. In some locations a "batch system" is available which weighs cement and additives separately into a mixer for blending the desired proportions. An "automatic weighing system" has been installed in many bulk stations for weighing and discharging simultaneously the bulk cement and additives. All materials are then blended, before being transferred to bulk convoys for movement to a well.

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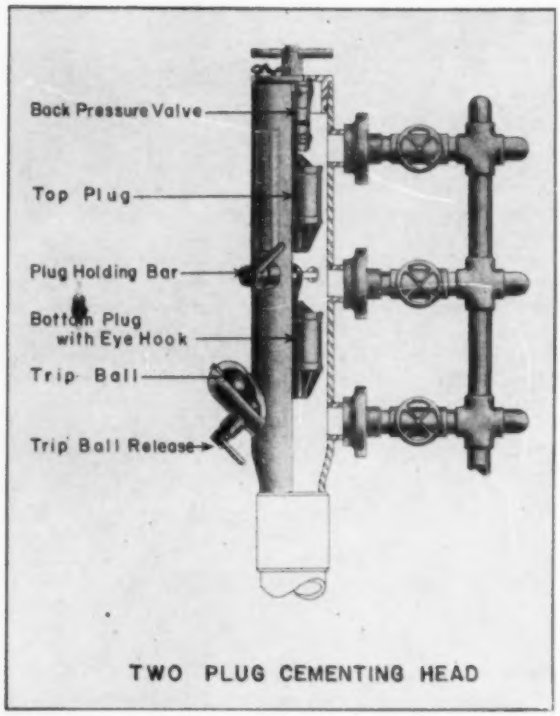

FIG. 3. Two plug cementing head shown is equipped for use in both conventional and stage cementing methods.

Mixing Equipment

Cementing trucks of several designs and capacities are available for mixing the water-cement slurry and pumping it to the desired placement area behind the casing.

A mixing truck consists of two basic components, a mixer and one or more cementing pumps. The commonly used hydraulic jet mixer functions by forcing a stream of water through a jet, across a bowl, into discharge pipe. The stream of water passing through the bowl creates a vacuum which pulls dry cement into the bowl from the hopper attached at the bowl. Turbulence created in the discharge line from the bowl causes thorough mixing of the slurry. The jet type mixer provides mixing at high rates, but is somewhat less efficient in possible control of water-cement ratios than mechanical mixers. Effective control can be obtained by weighing the slurry with a mud balance continuously until the mixing truck operator attains the desired slurry weight. Frequent checks with a mud balance assure continued control of the desired water-cement ratio. Fig. 1 illustrates the normal well setup for cementing operations.

Cementing Heads

The means for connecting the mixing truck discharge to a casing string comprises short lengths of 2-in. high-pressure line, equipped with quick-change couplings and swing joints, and a cementing head. Plug container heads should be used in most cementing operations, as their use eliminates air column in the pipe and expedites the placement of the cement. There are numerous types of cementing heads in use today, such as:

- Quick-Change Cementing Head

The use of this head makes it necessary to stop pumping operations to install the bottom plug and again to install the top plug. There are conditions, of course, where interrupted pumping is not advisable and this head should not be used.

- Conventional One-Plug Head

This head can be either rigged up for non-rotation or rotation of casing while cementing and holds only one plug.

- Two-Plug Cementing Head

This head will permit the installation of both top and bottom plugs before mixing cement and allows rotation of the casing without interruption of cementing operations.

- Special Heads

Such as those designed to hold plugs and tripping devices for multi-stage cementing operations.

Special Tools

Plugs. Channeling inside the casing is an occurrence that is not recognized generally and can only be prevented by use of a bottom plug. It is caused by a combination of factors present on every job, which are: (1) The sudden reduction of velocity of the cement when it comes out of the 2-in. discharge into the larger OD casing; (2) the cement falling inside the casing not displacing evenly being heavier or denser than the fluid already in the casing, and (3) a mud layer forming inside the pipe when mud is used as a drilling fluid. These basic facts cannot be changed, but their resultant problems can be prevented by running one plug ahead of the cement, and another behind it. The plug ahead of the cement (commonly called the wiper or bottom plug) serves to wipe the pipe clean and keep the drilling fluid in the pipe separated from the cement until the cement reaches bottom. This plug is so constructed that when it reaches the float or shoe, a small amount of pressure is built up which ruptures a rubber diaphragm allowing the cement to pass through the center of the plug. The top plug (run behind the cement) insures that the displacing fluid does not channel through the cement.

Floating Equipment. A guide shoe serves to guide the casing on its trip to the bottom of the hole. Many types are available for the different casing strings run in the United States.

A float shoe serves two purposes: Namely, a guide for the casing, and a check valve against back flow of the cement slurry. Float collars or baffle collars are normally used in cementation of intermediate, protective and oil strings. The baffle collar serves as a stop for cementing plugs, assuring proper displacement of cement slurry. Float collars provide both a stop for the cementing plugs and a check valve, preventing back flow.

A relatively new development is the differential fill-up tool which permits mud flow into the casing while running into the hole. With the use of this tool, it is not necessary to stop a casing job at frequent intervals to fill up the pipe, thus saving rig time. The floating portion of the casing reduces the rig hook load appreciably, thereby reducing both rig power and brake load requirements. Also, pressure surges on bottom are substantially reduced.

Modern cementing practices in deep wells emphasize the

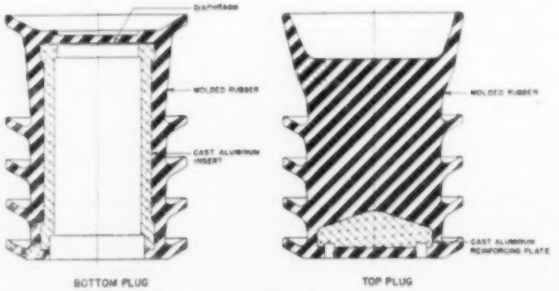

FIG. 4. Cross section of cementing plugs. Bottom plug is placed ahead of the cement and the top plug is inserted behind the cement slurry as it is pumped into position.

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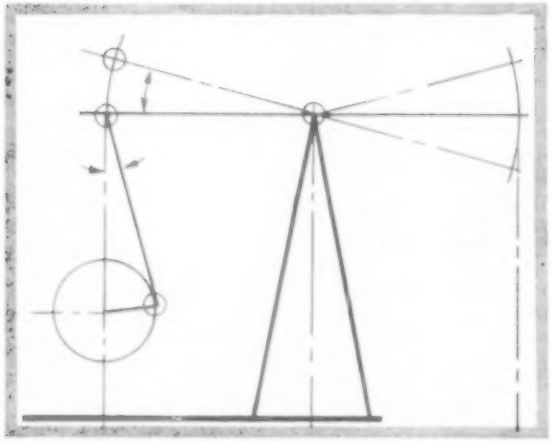

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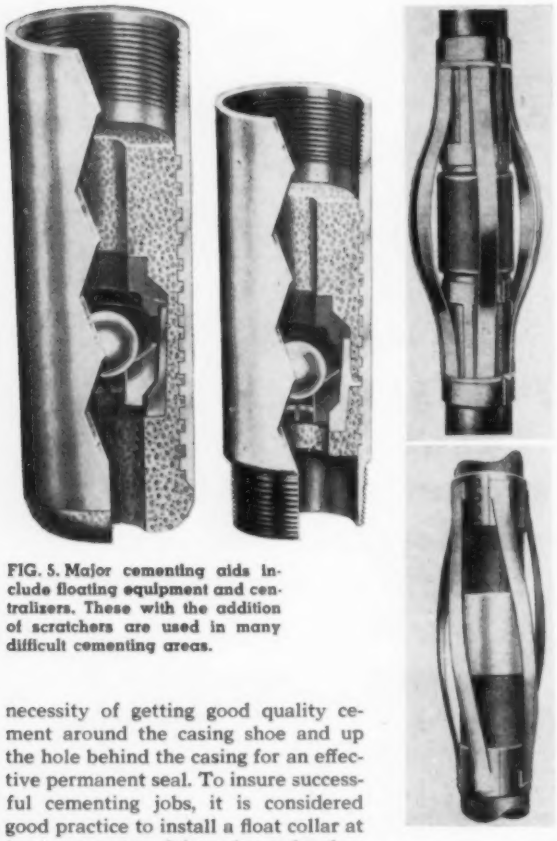

FIG. 5. Major cementing aids include floating equipment and centralizers. These with the addition of scratchers are used in many difficult cementing areas.

necessity of getting good quality cement around the casing shoe and up the hole behind the casing for an effective permanent seal. To insure successful cementing jobs, it is considered good practice to install a float collar at least one or two joints above the shoe so that when the top plug bumps the float collar, there will be 30 to 80 ft of cement slurry left in the casing. If there has been any contamination in the last of the cement, that contaminated cement will be left in the casing and not displaced around the pipe where it may result in a defective cementing job.

Centralizers. Centralizers hold the casing away from the sidewall to permit free circulation of fluid and placement of a solid cement sheath around the entire circumference of the casing. Some of the practical considerations of centralizing suggest:

- Centralizers should be used over the entire section to be cemented.
- Tension, compression, and flexure forces of unknown magnitude may be present throughout the casing string. Since centralizer blades may penetrate the sidewalls to an unknown extent, centralizers with maximum hold-off power should be used.
- The casing should be free to rotate without turning the centralizer.
- Both ends of centralizer should be free to permit vertical movement in either direction. Both straight and spiral centralizers are available in the industry.

Scratchers. The primary function of the scratchers is to remove mud cake from the sidewalls of the bore hole. At the start of reciprocation or rotation, the desire is to remove and replace the filter cake which has been in place for some time and which may have become thick and leathery or waxy. Then, during the cementation period, it is again desired to remove the freshly placed filter cake so that the cement slurry, as it progresses up the hole, can make intimate and complete contact with the actual wall of the well bore.

A second, but nevertheless important, function is to baffle and cause turbulence of the cement slurry so that it does not channel, but is distributed over the entire annular area.

There are two general types of scratchers available: The reciprocating, or ring-type, and the rotating, or strip-type. Quite naturally, both types of scratchers have their good and bad features and many arguments may be advanced for and against the use of either.

Indications in *some areas* are that scratchers should be equally spaced over the entire section. The most important reasons for this are: (1) Some channeling would be almost certain in the interval between the scratchers, and (2) there is danger that the cement, which eventually comes to rest opposite the production zones, would be badly contaminated by mud cake picked up by and mixed with the slurry as it passed the unscratched intervals.

Stage cementing. For various reasons, it is sometimes necessary to have an extremely high cement fill or to place cement at specific intervals behind the oil string such as to protect fresh water sands where the surface pipe was not set deep enough or to cover shallow productive zones for recompletion. The development of lost circulation additives for cement and low density cements has made it possible to obtain unusually high cement fills with conventional float shoe and collar. However, there are certain instances where multi-stage cementing tools are required for these special jobs. These tools are so designed that the cementing operations can be carried out in two or even three separate stages. The first stage is that of placing the cement around the shoe and up to the desired height around the casing. After the cement of the first stage has hardened sufficiently, a multi-stage tool located in the casing string can be opened and a second stage of cementing carried out to place cement opposite the desired interval. If necessary, a second multi-stage tool can be used above the first so that when the cement of the second stage has hardened sufficiently, the second multi-stage tool can be opened and a third batch of cement placed at the desired location behind the pipe.

Determination of Requirements

Adequate planning, proper equipment, correct performance, and sometimes the expenditure of a few extra dollars on a casing job can save many times over the cost involved by elimination of various troubles at a later stage of well life. The kinds of formation drilling through, differences in well temperatures, widely separated zones of production, and differences in drilling practices all cause some variation in cementing procedures and cement job requirements.

In planning for a cement job, certain basic information is required. Listed below are relevant items of general concern:

- Casing and hole size;
- Casing point;
- Condition of hole as concerns unusual washouts, lost circulation zones and drilling angle;
- Drilling fluid type and weight;
- Quantity and nature of filter cake;
- Bottom-hole temperature and pressure.

Electric logs are available aids for choosing casing-seat points, selecting proper points for mounting centralizers and wall cleaning devices, and for determining the general characteristics of the various formations that have been penetrated. The selection of the proper casing-seat point is most important for surface and intermediate strings of casing. Many joints of casing have been "whipped off" surface or intermediate strings during subsequent drilling because the casing-seat was set in a very soft formation

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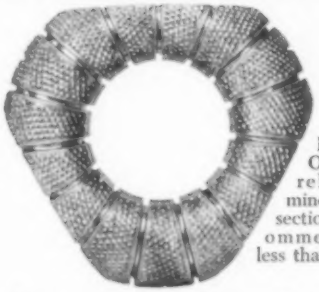

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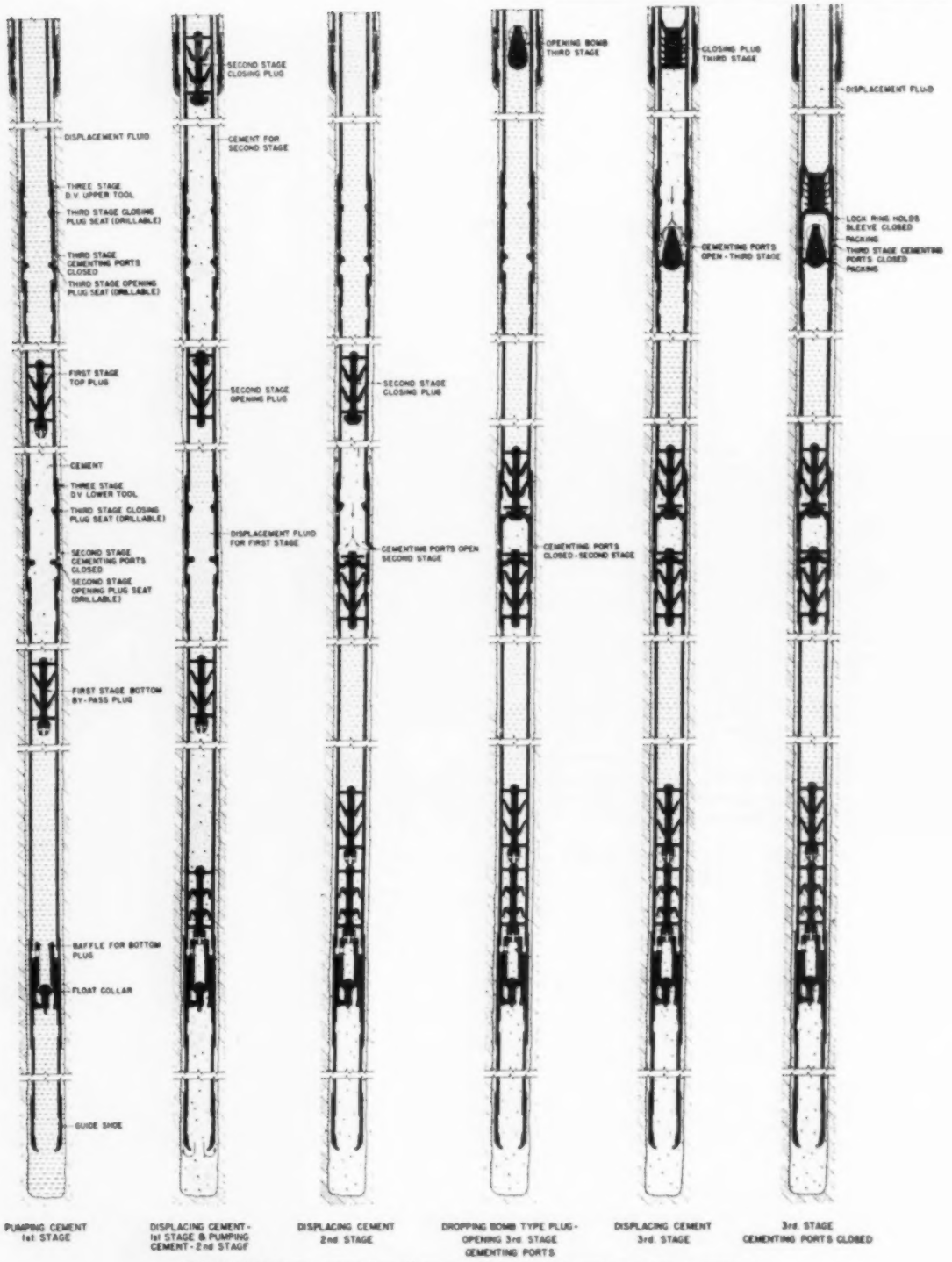
DISPLACEMENT FLUID
THREE STAGE D.V. UPPER TOOL
THIRD STAGE CLOSING PLUG SEAT (DRILLABLE)
THIRD STAGE CEMENTING PORTS CLOSED
THIRD STAGE OPENING PLUG SEAT (DRILLABLE)
FIRST STAGE TOP PLUG
CEMENT
THREE STAGE D.V. LOWER TOOL
THIRD STAGE CLOSING PLUG SEAT (DRILLABLE)
SECOND STAGE CEMENTING PORTS CLOSED
SECOND STAGE OPENING PLUG SEAT (DRILLABLE)
FIRST STAGE BOTTOM BY-PASS PLUG
BAFFLE FOR BOTTOM PLUG
FLOAT COLLAR
GUIDE SHOE
PUMPING CEMENT 1st STAGE
SECOND STAGE CLOSING PLUG
CEMENT FOR SECOND STAGE
SECOND STAGE OPENING PLUG
DISPLACEMENT FLUID FOR FIRST STAGE
DISPLACING CEMENT - 1st STAGE & PUMPING CEMENT - 2nd STAGE
SECOND STAGE CLOSING PLUG
CEMENTING PORTS OPEN SECOND STAGE
DISPLACING CEMENT 2nd STAGE
OPENING BOMB THIRD STAGE
CEMENTING PORTS CLOSED - SECOND STAGE
DROPPING BOMB TYPE PLUG - OPENING 3rd STAGE CEMENTING PORTS
CLOSING PLUG THIRD STAGE
CEMENTING PORTS OPEN - THIRD STAGE
DISPLACING CEMENT 3rd. STAGE
DISPLACEMENT FLUID
LOCK RING HOLDS SLEEVE CLOSED
PACKING
THIRD STAGE CEMENTING PORTS CLOSED PACKING
3rd. STAGE CEMENTING PORTS CLOSED

FIG. 6. Three-stage cementing diagrams illustrate the various steps in cementing a casing string in three stages. Note that cement may be displaced out the casing shoe, and out the casing at two separate horizons above bottom.

or enlarged hole. Electric logs are also indispensable in most areas for selecting the proper section to be perforated after the casing has been cemented.

Caliper surveys give a picture of the size of the hole vs well depth and are frequently used in conjunction with electric logs for casing point selection. The caliper log indicates the points that have been enlarged during drilling and those that are essentially still in gage or bit size. This information also indicates the points where centralizers and wall cleaners will be most effective. The volume of cement slurry necessary to fill the annulus to any desired height can be obtained from a caliper survey.

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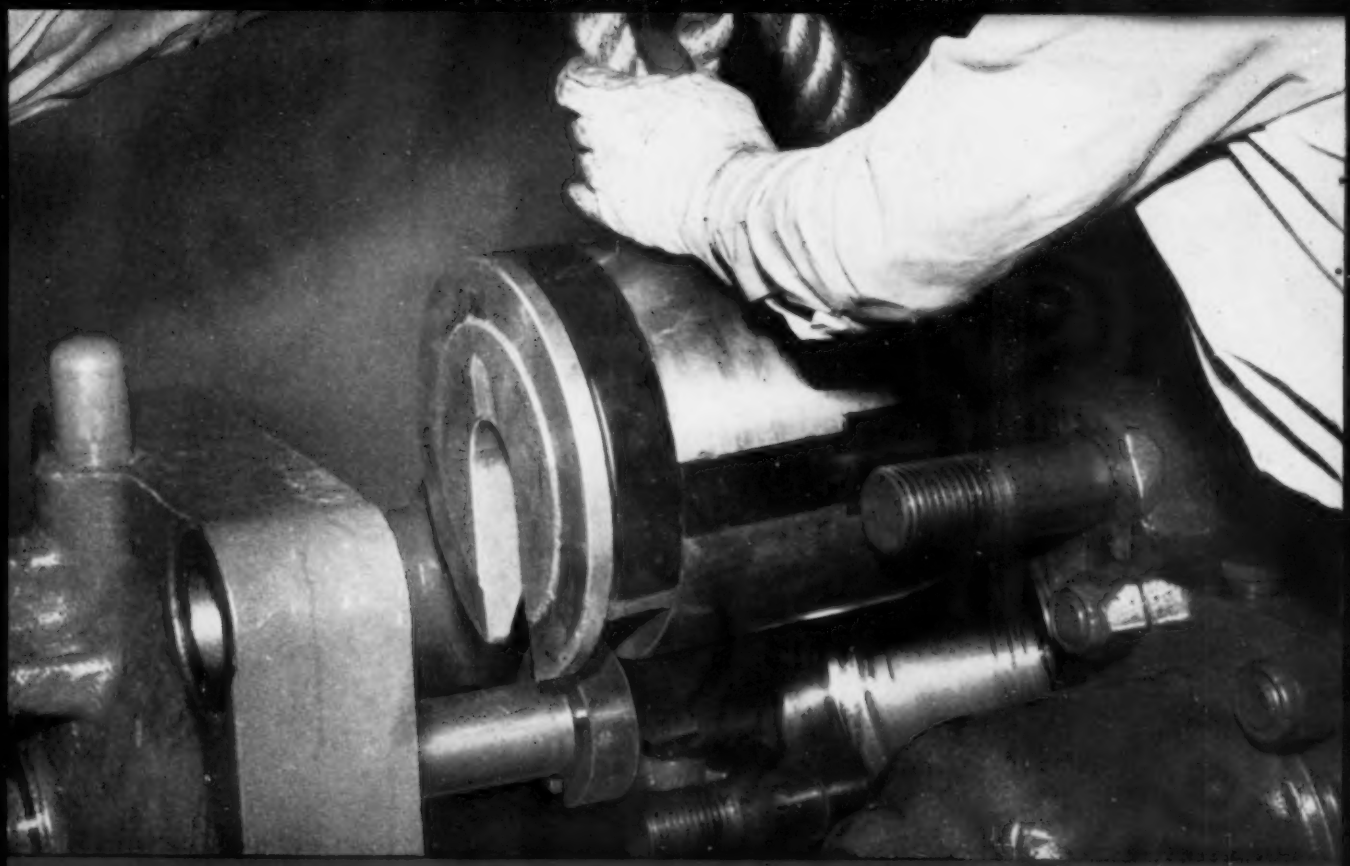

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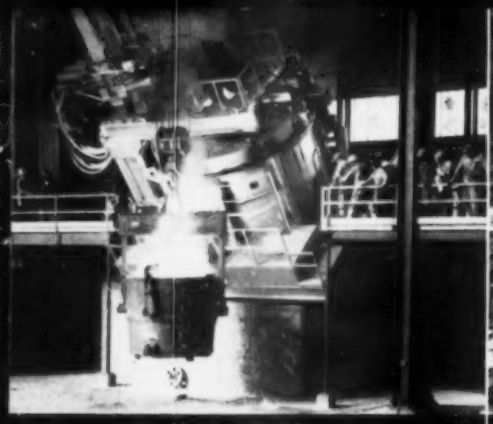
Ram design in any preventer is critical because this is the "business end"— the full force of destructive well pressures must be positively sealed off by the preventer rams. The facing page shows why the Cameron "QRC" Rams are so efficient.



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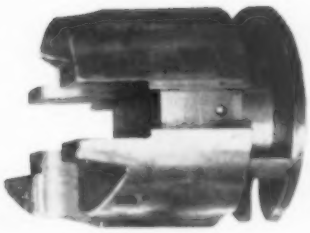
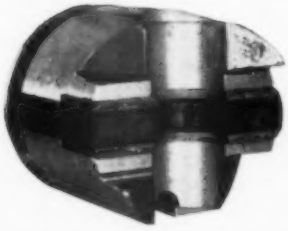
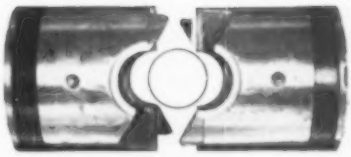


3. After machining and flame-hardening, the ram looks like this.

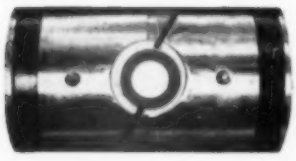


4. The complex internal surfaces vary in different rams according to pipe size.

5. Steel reinforced "QRC" ram packing element. A big volume of Hycar oil and abrasion resistant rubber stops extreme well pressures.



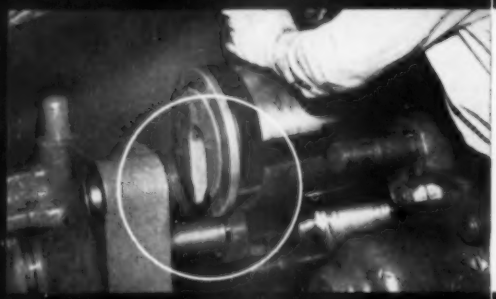
6. Wing guides automatically center pipe as rams are closed.



7. This view shows the rams closed without pipe in the hole. Note the red area indicating the big reserve of Hycar which is fed automatically to the pipe surface.

8. The rear seal ring traps well pressure, energizing the ram to maintain a constant seal.

9. In the Cameron Quick Ram Change there is no lifting, sliding or juggling of rams by hand on slippery cellar surfaces. Rams are safely lifted by catline — changed in minutes.



10. Preventers must open against extreme pressure. Consider this engagement between ram and ram connecting rod. Again the design is tough — tough enough to retract under any condition.

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The type of mud used in drilling and the nature and quantity of filter cake may dictate the use of bore wall scraping equipment in conjunction with centralizers which assure that a cement sheath surrounds the casing. While high flow velocity is helpful, in many cases some additional means must be used to remove mud cake in order to secure complete bonding at the critical points of protection needed in the well. Today in most areas mechanical means for well bore mud removal are accepted practice. Both the rotation and the reciprocation types of wall cleaning devices, together with casing centralizers, are in common use.

Selection of a cement material for the particular job is the next step. Cement must possess sufficient tensile and compressive strengths to be acceptable for cementing oil wells — also, a number of secondary properties. Primary considerations in selecting a cement for use in a given well are:

Thickening time. A cement must possess enough thickening time (the time the cement slurry is fluid enough to be pumped) for it to be pumped into position in the well with a reasonable factor of safety.

Setting time. Cement must set within a reasonable time after it is placed in the well.

Strength. Cement must develop sufficient strength to permit resumption of operations within a relatively short time, often within 24 hours or less. Selection of cementing materials has been based through the years on adequate thickening time, high compressive strength, and fast rate of strength development. More recently, the literature has shown much applied research on lower strengths using modified cements. Desirable perforating characteristics, lower material cost, proper densities and adequate thickening times promoted this effort.

The work on strength requirements indicated severe shattering or cracking of cement with tensile strengths of 300 psi and greater. At 200 psi ultimate tensile strength and below (approximately 2000 psi compressive strength), perforating can be accomplished without shattering. On the basis of these studies, many modified cementing procedures have been used in the industry. One writer suggests that tensile strength of 8 psi (immediately after initial set) is adequate to support the weight of casing and effect a permanent seal. Table 1 provides data on the amount of cement necessary to support different casings.

TABLE 1—Estimation of Cement Required to Support a Given Length of Pipe.

Pipe Size In.	Weight Lb/ft	Length of Pipe 1 ft of Cement* should support, ft
5½	14	325
	15.5	294
	17	268
	20	228
	23	198
7	20	228
	23	198
	26	175
	29	157
	32	142
	35	130
7⅝	24	190
	26.4	172
	29.7	153
	33.7	135
	39	117
8⅝	28	163
	32	142
	36	126
	40	114
	44	103
9⅝	32.3	141
	36	126
	40	114
	43.5	105
	47	97
	53.5	85
10¾	40.5	112
	45.5	100
	51	89
	55.5	82
13⅜	48	95
	54.5	83
	61	75
	68	67
	72	63

*Based on tensile strength of 8 psi.

Slurry volume required. The selection of cementing materials requires the determination of volume of the annular section and lower portion of casings to be filled. The hole may be measured with a caliper survey as discussed above, or the volume may be estimated on the basis of previous experience for the particular area concerned.

Type of cement. There are three general types of oil well cements as discussed in the section on Cementing Materials: (a) High early strength, (b) standard Portland, and (c) slow setting. Initial setting time and compressive strength vs time will determine the selection between high early strength and regular Portland cement. Bottomhole circulating temperature is the major determining factor in the selection of regular Portland or slow setting cement, as this directly affects pumping time of the slurry to be used.

The addition of bentonite to the dry cement allows the use of more mixing water per sack without separation of the solid and liquid phases.

In addition to perlites, cellophane flakes, mica flakes, and walnut hulls, plastics and fibrous materials have been used in certain applications.

For light weight, low strength cements, pozzolans or Diacel systems may be applicable when high temperature cement or low cost cements are required. Lime added to certain pozzolanic materials provides a satisfactory cementing material for high temperature use. Diatomaceous earth may be applied to low water loss, low viscosity, light weight and lower strength slurries (10.5 to 13.5 lb per gal).

Evaluation of Cement Jobs

Pressure Tests

State regulatory bodies require that pressure tests be made on the different casing strings both before and after drilling out the casing shoe. As an example, Texas requires that protective and production strings be tested to a pressure of 0.2 × casing length or a maximum of 1500 psi. Cement failure at the casing shoe and casing leaks can be recognized by this method.

Temperature Surveys

The temperature survey instrument is essentially a thermometer which measures and records graphically the temperature of the well fluid as the instrument passes through it. Temperature surveys, made within a few hours after cementing a well, enable determination of the height to which the cement rose behind the casing. The optimum time for making temperature surveys will vary with the cement being used, the depth and temperature of the well, and other factors, but will generally fall within a 2 to 12-hour period after the cementing job is completed.

Temperature survey interpretation. While there remains a great deal to be learned concerning the interpretation of temperature surveys, some things can be read from the curves and certain conclusions drawn. These can best be illustrated by reference to the portions of theoretical and actual temperature curves in Fig. 8.

First, it should be remembered that the normal temperature in a drilled hole increases more or less regularly with depth, this being called the normal temperature gradient. In a theoretical case, then, a curve of the normal gradient would be a straight line whose slope would depend on the rate at which the temperature changed with depth. This is shown as Case A.

Next, setting cement would give off the same amount of heat at each point and a temperature log taken a short time after cementation would be a straight line from the bottom to the top of the cement with a slope equal to that of the gradient curve. At the top of the cement, the

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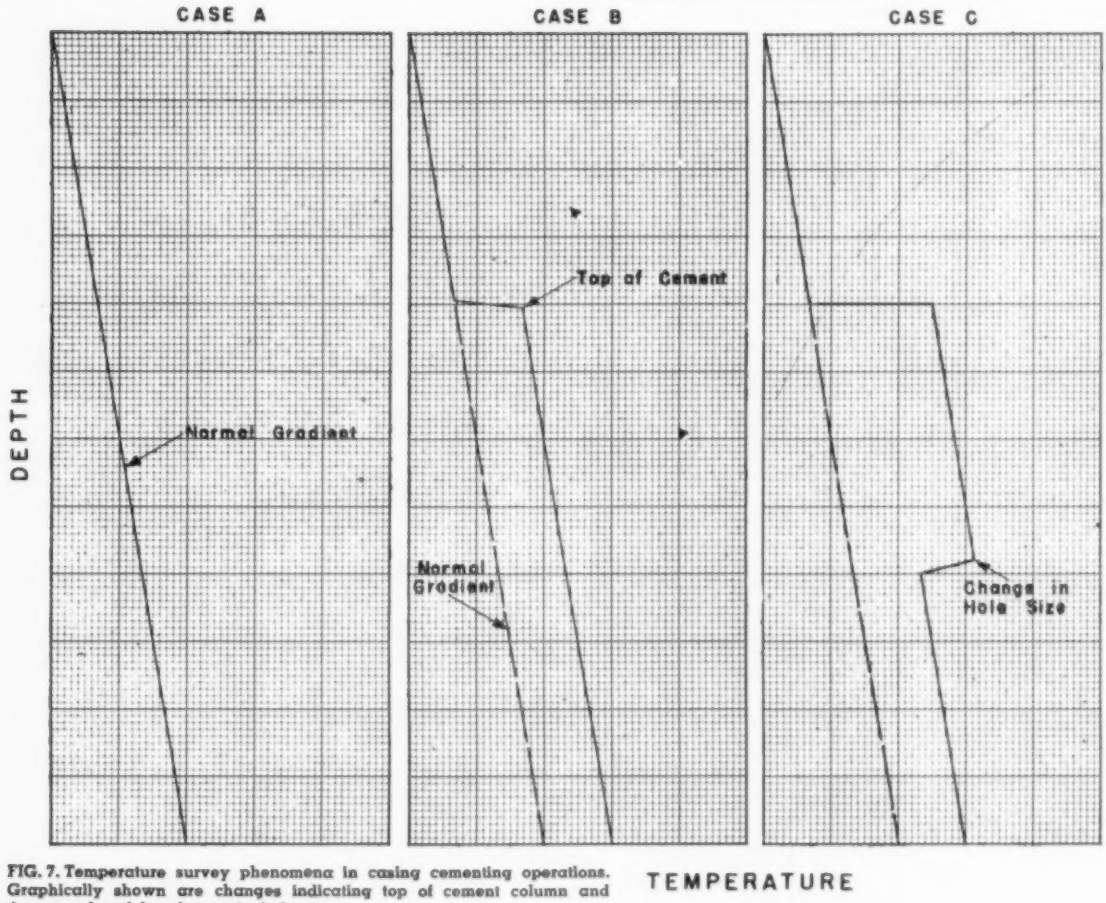

FIG. 7. Temperature survey phenomena in casing cementing operations. Graphically shown are changes indicating top of cement column and those produced by change in hole size.

curve would quickly return to and then follow the gradient curve. This is shown in Case B.

Assume that two sizes of bits were used in drilling the hole. In this case, the larger hole containing more cement would give off a greater amount of heat and a temperature curve similar to Case C would result.

It may be said then, that an increase or decrease in temperature indicated by the temperature survey curve is due either to a change in the normal gradient at that point or to a change in the amount of heat which has been given off by the setting cement. Generally speaking, the amount of heat given off is a function of the volume of cement at that point, and changes in this volume normally are caused by changes in the hole size, or by channeling of the cement. In interpreting the temperature curve, the observer must be able to evaluate the influence of gradient and hole size changes.

Use of Radioactive Material

For special applications such as squeeze jobs, radioactive material can be added to cement slurries and located behind the casing by use of conventional logging.

Use of Free Point Indicator

The free point indicator test provides information on the lowest point at which the casing string is free to move. In many cases, this point may not be the top of the cement column. Casing stretch tests also are used in some cases to locate cement top, but generally they are quite inaccurate.

Well Tests

The final analysis of well cementation is afforded by well tests made subsequent to cementing operations. If a well produces in accordance with the anticipated rates of flow and no producing difficulties arise, the cementation is a satisfactory operation. However, subsequent recompletion work above or below the producing zone may prove the cement job inadequate for this type work, and remedial measures, as squeeze cementing, may become necessary.

Acknowledgment

The author wishes to express his appreciation for permission granted by Shell Oil Company to publish this paper. Much of the material is covered in company reports under the authorship of several individuals. Also, special thanks are due Halliburton Oil Well Cementing Company for the use of their publications and special material.

Bibliography

1. Dickinson, G., "Geological Aspects of Abnormal Reservoir Pressures in Gulf Coast Louisiana," AAPG Bulletin, 1953.
2. Ludwig, N. C., "Portland Cements and Their Application in the Oil Industry," API Drilling and Production Practice, 1953.
3. Morgan and Dumbauld, "A Modified Low Strength Cement," AIME Transactions, Vol. 192, 1951.
4. Morgan and Dumbauld, "Recent Developments in the Use of Bentonite Cement," API Drilling and Production Practice, 1953.
5. Smith, D. K., "Physical Properties of Gel-Cement," *Pet. Eng.*, April, 1951.
6. API Bulletin D-4, "The Effects of Drilling Mud Additives on Oil Well Cements."
7. Anderson, F. M., "Modern Oil Well Cementing Operations," API Paper, June, 1953.
8. Clark, E. H., "Bottom-Hole Pressure Surges While Running Pipe," ASME Conference, Los Angeles, 1954.
9. Farris, R. F., "Method for Determining Minimum Waiting-on-Cement Time," *Pet. Tech.*, January, 1946.

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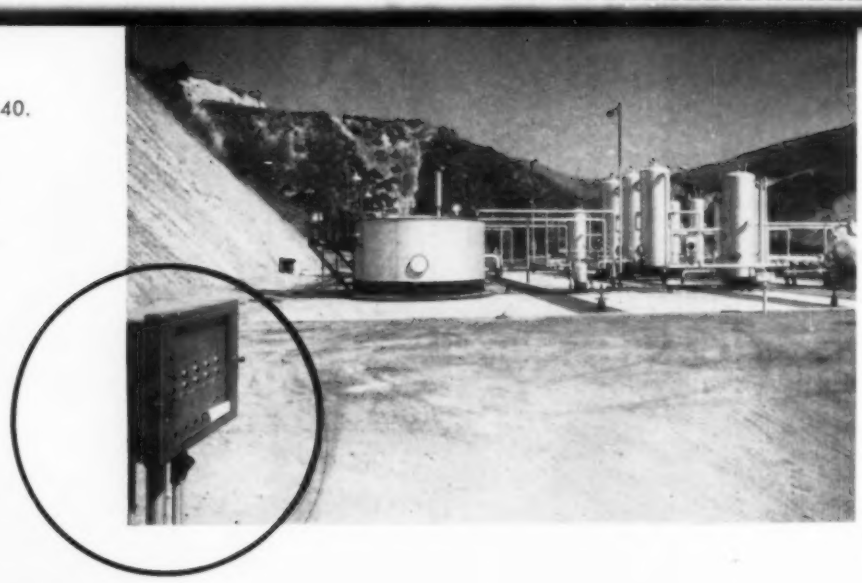
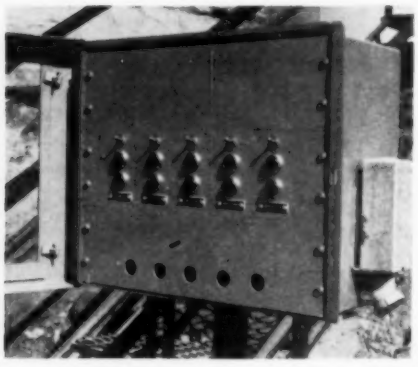


Local alarm indicator installation (circle) at Taylor Trap Farm No. 23 is typical of Shell's 22 units in Ventura field. **Local fault alarm indicator** at one of the Ventura field batteries shows what function has caused the alarm at the control station. Fault location indicator continues to function until fault is corrected and indicator is re-set.



Ventura Field's Automatic Alarm System

"Watchdog" system alerts Shell Oil Company personnel to lease tank level excesses and high separator pressures. Cost analysis not yet available on operational savings of audio tone signaling equipment recently installed on 22 lease units

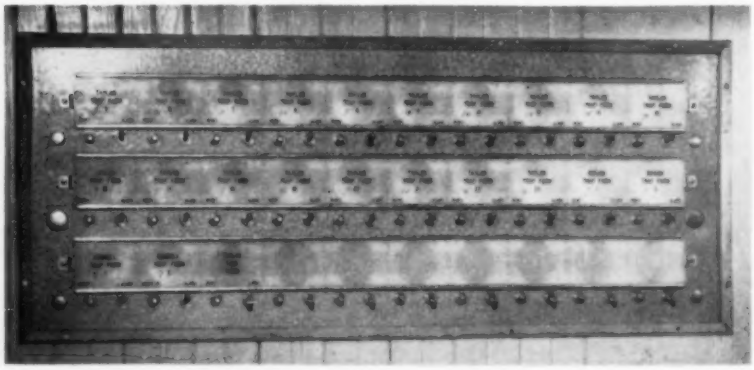
PROBLEMS centralizing surveillance of 22 "trap farms" (lease batteries) in the Ventura field, California, have been efficiently solved by Shell Oil Company through the use of audio tone signaling equipment. Centralized operations control units installed by Shell permit a fault alarm indication of malfunctioning of gas-oil separators and also a high-level warning for tanks at each individual lease battery.

The equipment installed by Shell eliminates costly "spills" or runover of tanks. Pressure within the separators, in the event of a "spill," results in a spray of oil over a large portion of the trap farm.

Single Telephone Circuit

In the Ventura field installation, audio frequency tone signals are carried on a single two-wire telephone circuit over a distance of up to three miles. Trap farms are located so they are separated from each other by a distance varying from ¼ to ½ mile. All 22 trap farm alarm signals are transmitted to the centralized alarm system, however, through the single telephone circuit. The circuit is owned by Shell and is a transposed line capable of carrying up to 7000 cycles with relatively low signal attenuation.

To adapt equipment to the mechanics of the trap farms, float switches were installed on the gas-oil separators and electrical conduits were run to remote control cubicles housing the audio tone signal equipment. This equipment is connected directly to the telephone circuit.



Indicator panel at control station. Immediately upon malfunction at any one of the batteries, visual and aural alarm is given and trouble-shooting crew is dispatched.

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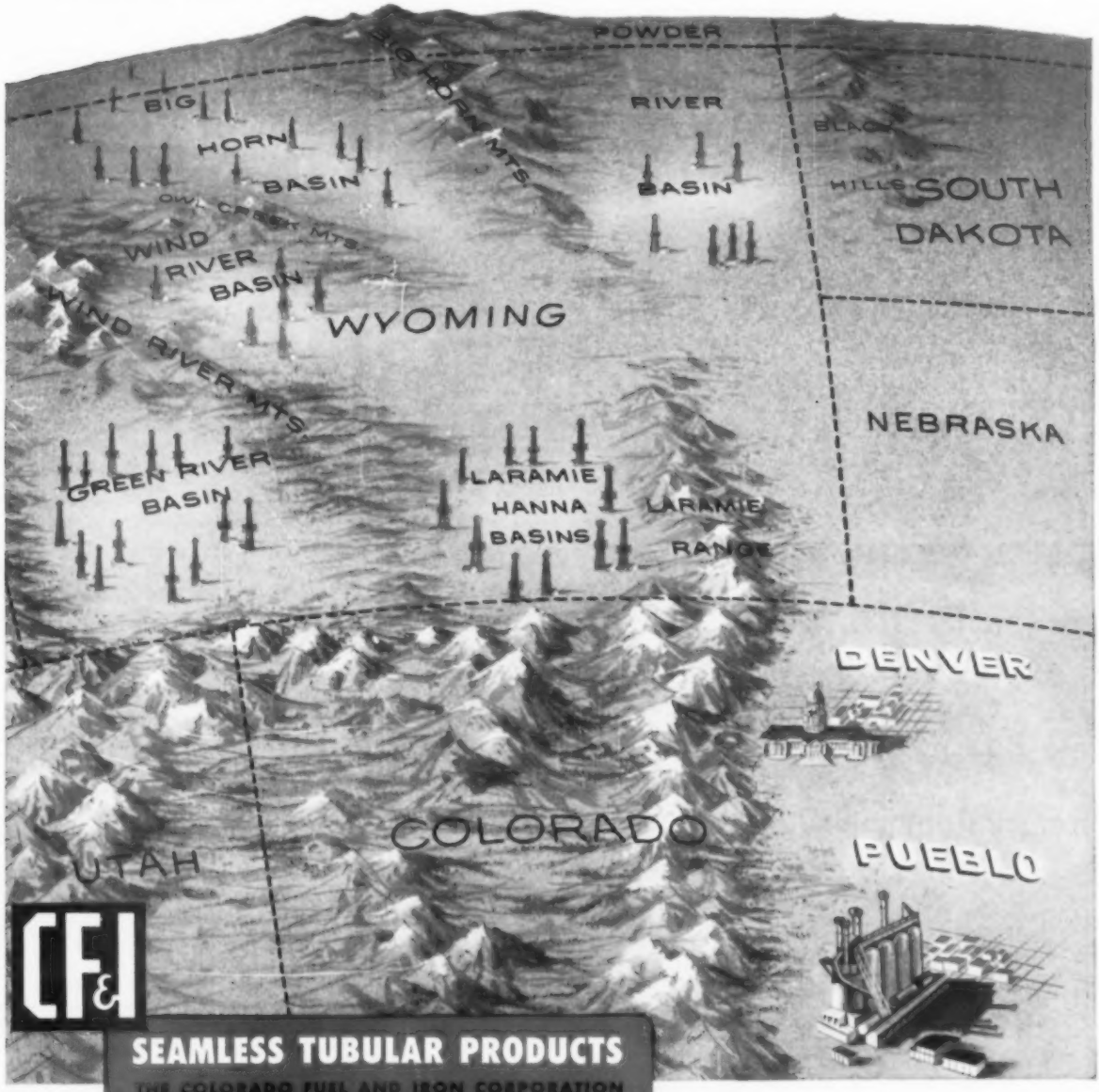

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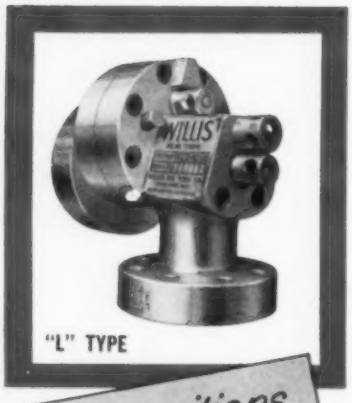

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In the event of a malfunction at the trap farm, a visual warning is flashed and an aural alarm is sounded at the central control point. A man is immediately dispatched to the battery indicated on the master control board. Upon arriving, the trouble-shooter checks the remote control cubicle which localizes the trouble within the installation by means of indicator lights. Fault indication is cleared after correction by means of switches located in the remote control cubicle.

Transmission Failure

Equipment installed in the remote control cubicle is an audio tone transmitter that sends out a warning signal of a pre-determined frequency to the central control point. Frequency of the tone is translated at the control point by a receiver tuned to the same frequency and thus indicates the particular station having difficulties. The audio tone from the trap farm is constantly on; removal of signal for any reason provides the alarm indication. In this manner, any electrical or transmission failures of the system would also act as an alarm, assuring maximum dependability.

The remote station may be operated to indicate locally any number of malfunctions needed. This equipment, however, merely advises the control point that something is wrong at that particular station. The system essentially provides "fail-safe" remote alarm signals for 22 separate operating points simultaneously over one telephone line.

Self-Contained Units

The design of the control equipment is such that each piece of equipment is entirely self-contained and does not depend upon another unit for power or interconnections. This permits expansion of the system at any time and to any degree, merely by the addition of transmitter or receiver units.

Overall Control

The main advantage in an installation of this type is in the overall surveillance of the entire operation. Actual savings in money have not yet been established outside of the fact that costly spills have been eliminated. Reliability of the system is very high, due to the simplicity of operation. Over a perod of six months, the system has required only one tube replacement after the initial shake-down period of two weeks.

Acknowledgment

Grateful acknowledgment is made to the Hammarlund Manufacturing Company, Inc., whose alarm indicator equipment was installed on the Shell Oil Company project. ★ ★ ★

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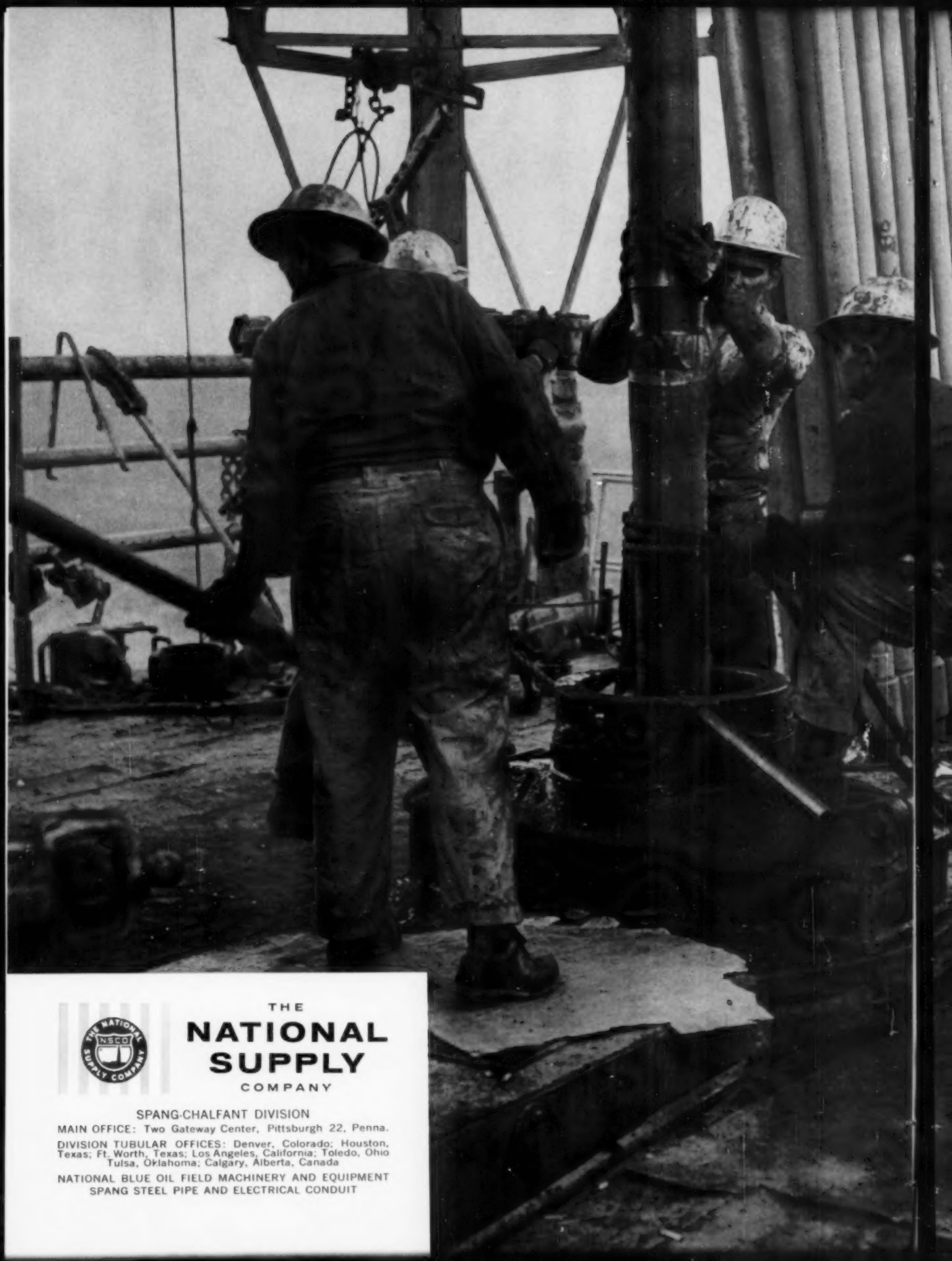

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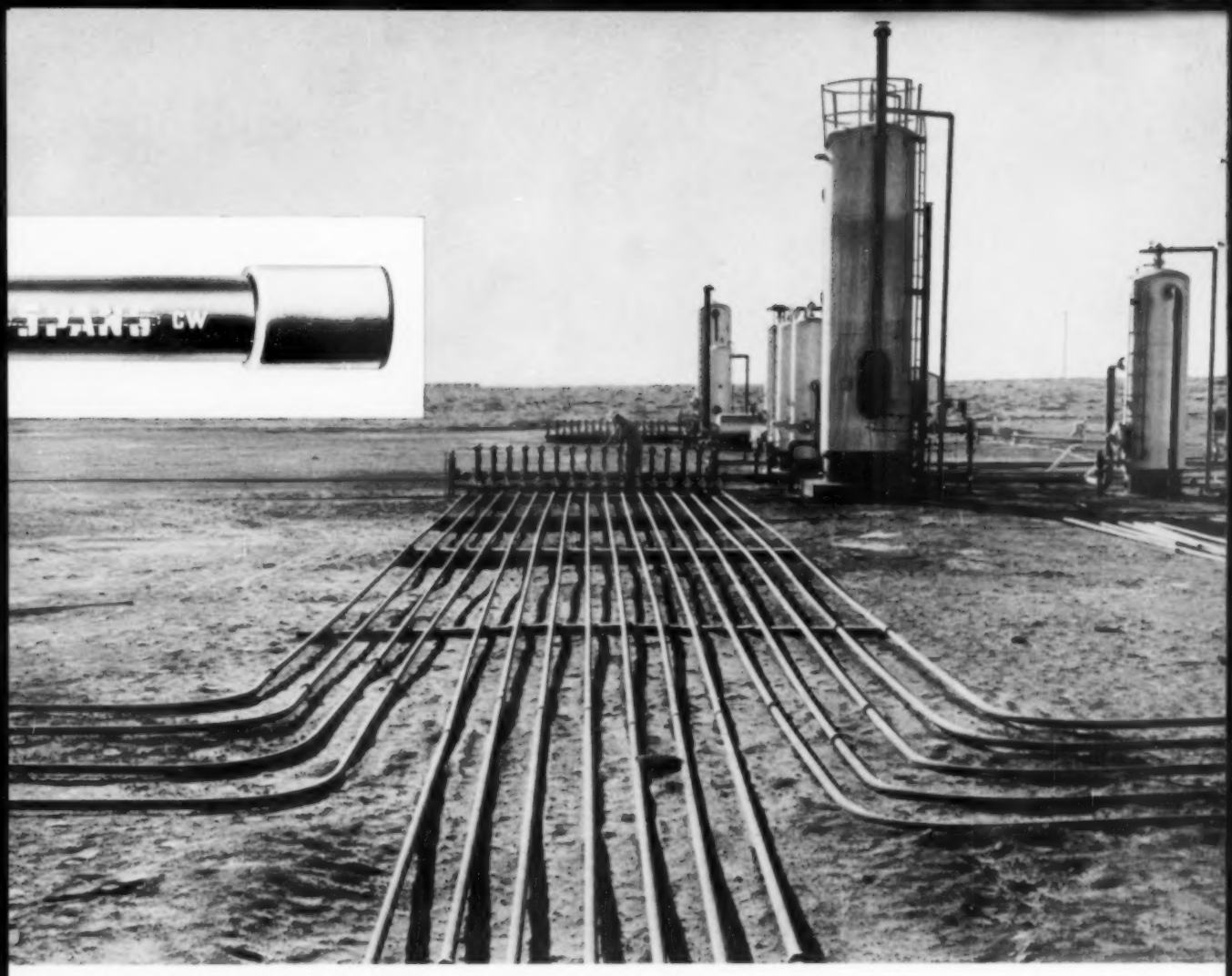

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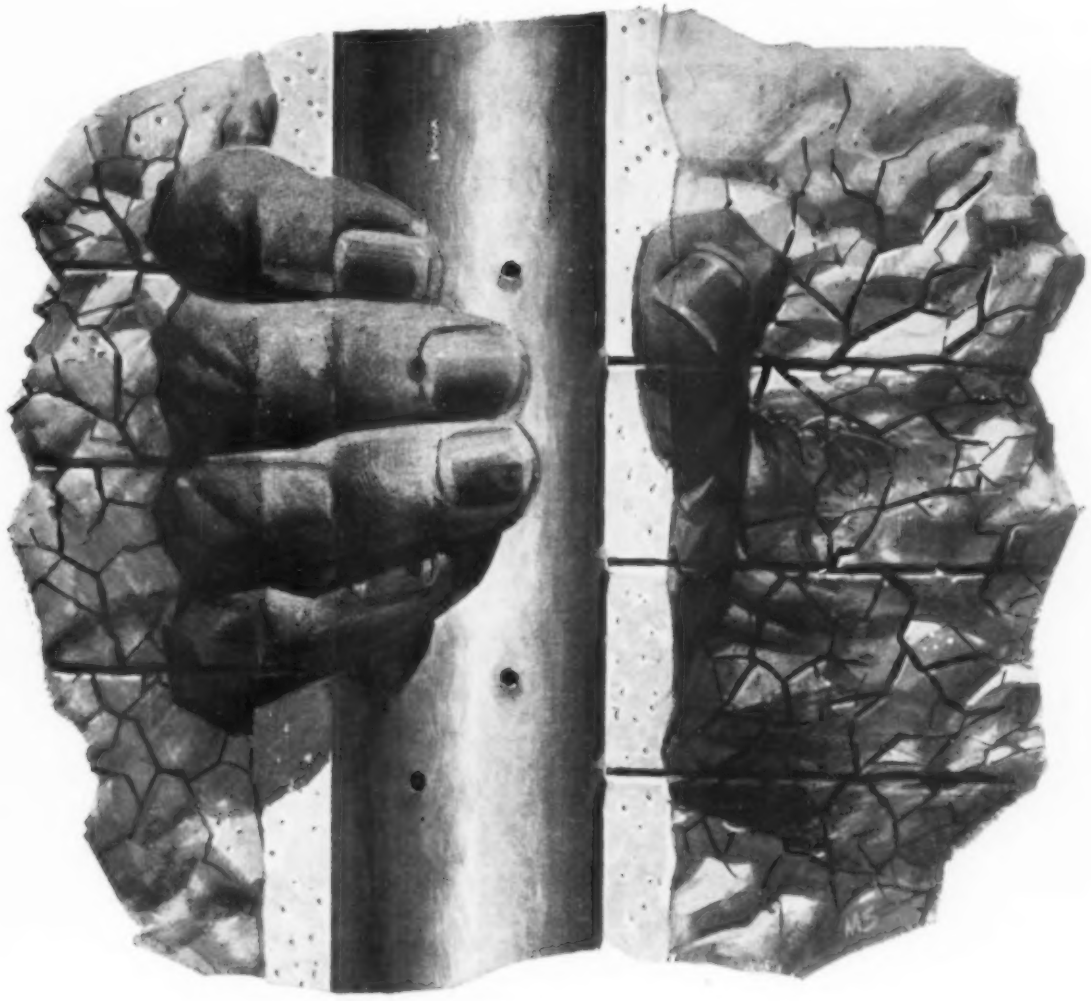

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Tax Value of Secondary Recovery Production

Producers have overlooked the tax burden of credits on secondary recovery operations—too long based on relative value of primary oil production

R. T. Savage
Tax Agent,
Sohio Petroleum Company
Oklahoma City, Oklahoma

WHAT is the worth of a watch? Everyone has been to auction sales and witnessed "blind purchasing" of just such items. Producers may fall into the same classification of "suckers" for accepting the methods used in arriving at credits for secondary recovery operations.

Perhaps the importance of this tax burden is being overlooked. It is time to examine the position of the producer in this respect. Many companies are likely to pay up to $10,000,000 in taxes next year on secondary recovery projects or pressure maintenance projects. And there is little likelihood of its going down materially in the next 15 or 20 years. Certainly a tax bill of this size is worth some study and effort.

There are now 21 billion bbl of reserves discovered and remaining to be discovered in waterflood operations only. The peak production from water floods is not expected until sometime between 1956 and 1980. The 1955 waterflood production was about 130,000,000 bbl. As far off as the year 2035, it is estimated that the production will still be 60,000,000 bbl annually.

Oil production from secondary recovery projects is becoming more and more important each year. The total annual production from water floods has increased from 80,000,000 to 130,000,000 bbl in only four years — accounting for over 5 percent of the country's production in 1955.

Waterflooding to increase production was first proposed by J. F. Carll in 1880 in the Second Geological Survey for the Pennsylvania Topographic and Geologic Survey. No serious attempts, however, were made to make use of the theory until 1921, when the method was legalized.

Secondary recovery projects are not as common during depressed oil price structures, and particularly not during a time when quantities of virgin oil can be found by exploration. Since the war, however, and especially in the last five years, major oil discoveries have been quite limited — this, in spite of an era of record drilling each year. This has as much bearing on the sudden splurge of secondary recovery operations as any other single factor.

There has been much talk in various states and areas of a "secondary recovery allowance." There is a difference of opinion as to why such an allowance should be given. The purpose of this study is to discover just why there should be a "secondary recovery allowance" and how much it should be.

Perhaps the first step would be to define what is classed as secondary recovery production, for the purposes of this paper. This study will be confined primarily to operations which attempt to recover additional oil after depletion of the initial reservoir. No effort is made to study those projects ordinarily classed as pressure maintenance, which have to do with injection of gas, air, water, etc., near the inception of production. Secondary recovery projects ordinarily come in four classes:

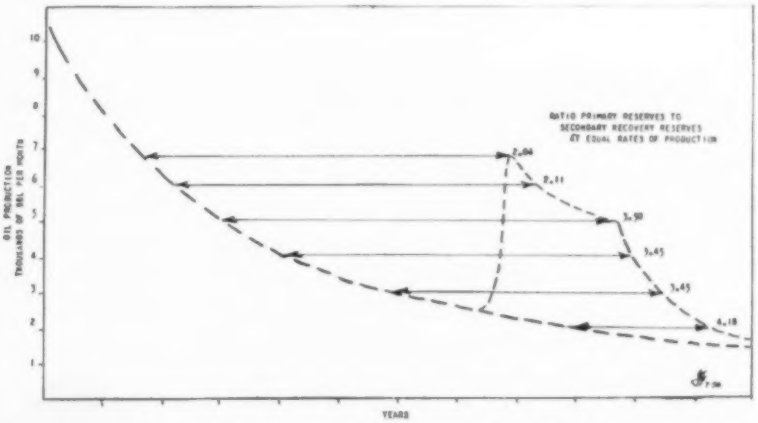

FIG. 1. **Gas injection project** on the W. W. Boyce lease in the Burnell South field, Karnes County, Texas. Relationship established here illustrates that 2.04 bbl of primary reserve is equal to 1 bbl of secondary reserve at the same rate of production. Source: A Survey of Secondary Recovery and Pressure Maintenance Operations to 1952. The Texas Railroad Commission, pg 57.

Presented before the Annual Advalorem Tax Forum of the Mid-Continent Oil & Gas Association in Fort Worth, Texas, December 13, 1956, under the title "Relative Daily Barrel Value of Secondary Recovery Production Compared to Primary Production."

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Stations Throughout the Mid-Continent Area

1. Gas
2. Waterfloods
3. Others, such as air, carbon dioxide
4. Combinations of two or more of the above.

Practically all valuation schedules have as a base the daily average barrel of primary production. The general practice in assessing secondary recovery projects is to value them as if they were primary production, and deduct from this some percentage as an "allowance." Assuming this is the correct method, a comparison must be made of the daily average barrel of primary production with the daily average barrel of secondary recovery production. Origin of the daily average barrel valuation method must first be examined.

This method of oil property valuation is, perhaps, the oldest of the various methods used — even for buying and selling. First used in the early days of the Appalachian region, its use spread to the Mid-Continent area shortly after the turn of the century. Today, for most purposes, the method has been largely replaced by more accurate reservoir engineering methods. But, in some areas, properties are still bought and sold by this rule of thumb. It also is used frequently as an alternate check for evaluations made by other methods. Because of its simplicity and reasonable accuracy, its use is widespread in appraisals for taxation. Taxing officials have generally conceded that the daily barrel of secondary recovery production is worth less than the daily barrel of primary production, and have reduced the appraisal value of the secondary recovery average daily barrel up to 40 percent of the primary daily barrel; however, there is considerable disagreement as to what the fair and equitable percentage should be. Kentucky has a statewide allowance of 40 percent. All Illinois counties that have secondary recovery production now allow 33⅓ percent. The percentage in Texas and Kansas vary with the location and the taxing officials.

The Illinois allowance got its start in 1945. At that time, the valuation schedule was $100 per daily average barrel for first year production, $200 per bbl for second year production, $300 per bbl for third year production, and $400 per bbl for fourth year production and thereafter. These were equalized values, and were set to allow relief for flush production many, many years before.

A water flood had been started in Marion County, and a compromise allowance for the water flood arrived

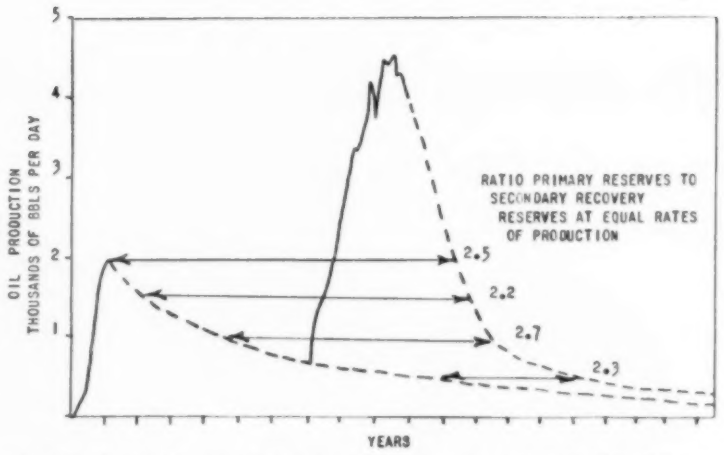

FIG. 2. **Production history** of Patoka Benoist waterflood, dated May 25, 1950. This is in Marion County, Illinois. After Barger, O&GJ.

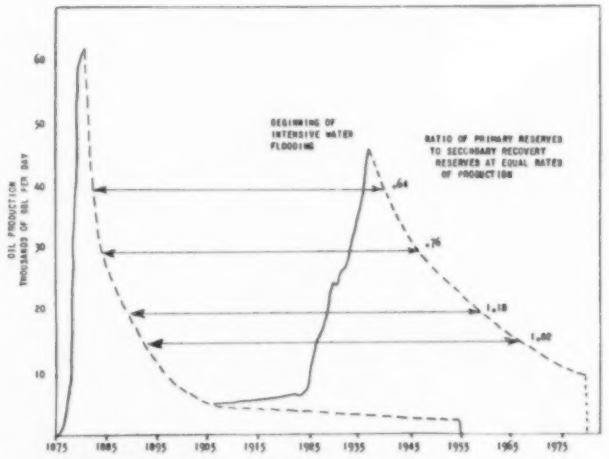

FIG. 3. **Bradford district water flood** in Pennsylvania. This field was produced so inefficiently during primary production that ultimate waterflood recovery is more than double primary production. After Buckwalter, Producers Monthly, October, 1953, pg. 22.

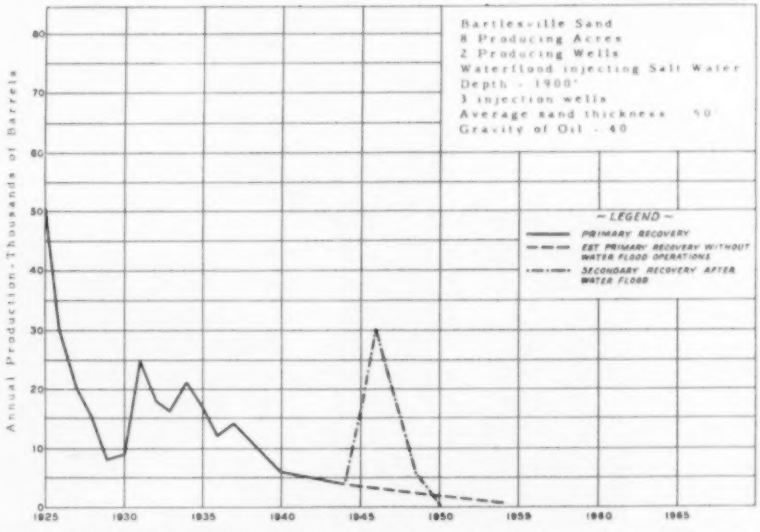

FIG. 4. **Bratton unit, Thrall-Aagard pool,** Greenwood County, Kansas. Source: Unitized and Cooperative Projects in the U. S., pg. 50, Interstate Oil Compact Commission, September, 1952.

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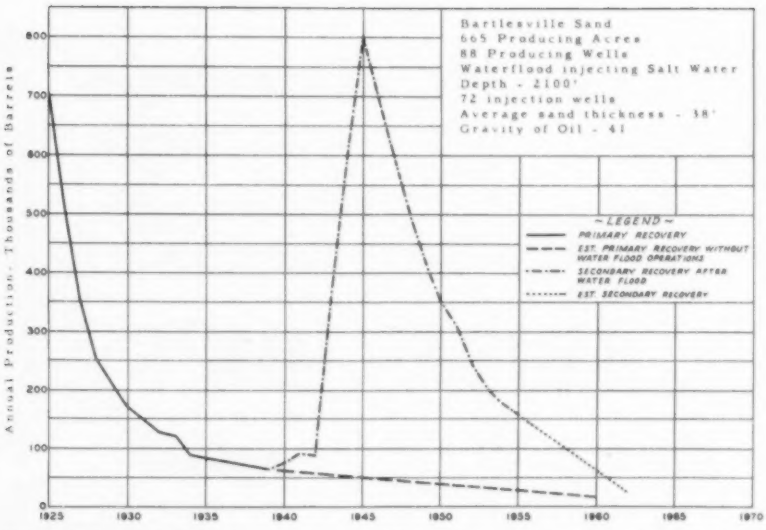

FIG. 5. **Burkett unit, Burkett pool,** Greenwood County, Kansas. Source: Unitized and Cooperative Projects in the U. S., pg. 50, Interstate Oil Compact Commission, September, 1952.

at. Instead of assessing four year wells at $400, allowance was given to start again at $100 from the time the production showed an increase due to waterflooding. As far as is known, this was the first waterflood credit in Illinois. Incidentally, this allowance figured about 55 percent.

This was all right, since a basis had been established in relation to the primary schedule, but the next year the primary schedule was changed to a flat $800 per bbl, regardless of age. This necessitated another controversy over the relief to be allowed. The years 1946 and 1947 were protested, and objections were filed in County Court. The case was unable to be tried for some time, so on January 20, 1948, we wrote the Illinois Department of Revenue, requesting a study. At a 1948 schedule meeting with the Department, a compromise allowance of ⅓ off the primary schedule for all secondary recovery projects was offered. This was accepted, and the years 1946, 1947, and 1948 were settled on this basis. The ⅓ recommendation was withdrawn the next year, and protest was again required. Finally, in the summer of 1950, the years 1949 and 1950 were settled on the same ⅓ allowance basis. Since then, there has been no difficulty with this particular part of assessment in Marion County. This also seemed to set the pattern for the rest of Illinois.

The Kentucky allowance was originally set at ⅓, at about this same time, but a later compromise arrived at a 40 percent credit. Some assessing officials allow the royalty interests the benefit of this adjustment, but others refuse to do so on the basis that the allowance is for additional operating expenses. Some assessing officials add valuation to the working interest for the additional equipment necessary for secondary recovery operations, but others do not assess the equipment, as an extra allowance. Very few cases are known where allowances are made for secondary recovery other than water floods. Such allowances are usually minor.

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Thus, there is statewide consideration given to the fact that secondary recovery production is less valuable than primary production *on a daily average barrel basis* — let me repeat — *on a daily average barrel basis*. Now, why is it less valuable?

Some have contended for an adjustment because of increased cost of producing the oil — and this need not be wrong. Although it may not present too strong a case in some instances, another contention, and the one presented here, is that when water or some other substance is injected to increase production, the relationship between the value and the daily average barrel is radically changed. If a yardstick is used to measure yards, the method of measurement when dealing with feet must be different.

In trying to arrive at a reasonably equitable method, one can become easily confused. A method of comparison was decided on which is certainly not exact, but perhaps is reasonably correct, since only averages are being dealt with.

The attempt is to determine the actual value of a daily barrel of secondary recovery oil, as compared with a daily barrel of primary oil. The search is for a factor to be applied to the secondary recovery daily barrel, to place it on an equitable basis with the primary daily barrel. Relative costs of each type of operation, either in locating or producing are not being considered. For the purpose of this study, one barrel of reserve of secondary recovery oil was considered to be worth the same as one barrel of reserve of primary oil. It is generally conceded that the cost of producing secondary oil is greater. Secondary recovery oil is, however, recovered in a shorter period of time. Therefore, the discount factor for present worth of future dollars would not be as high. Perhaps these two variables do not exactly balance each other but, for this purpose, these are considered as being

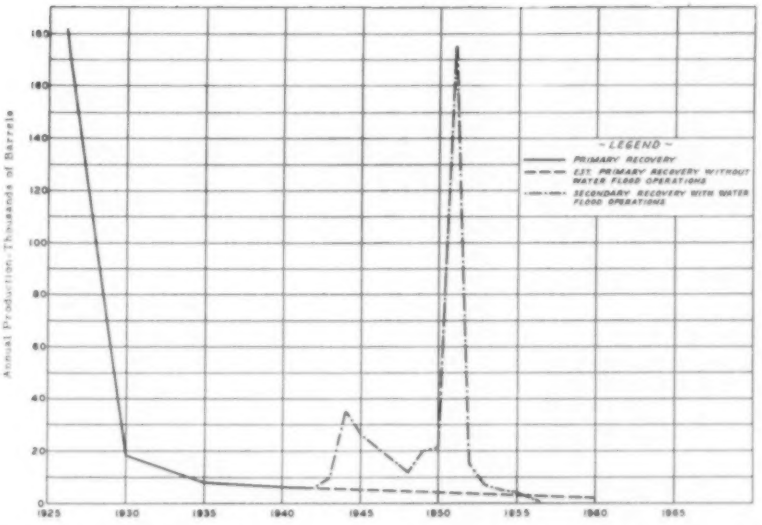

FIG. 6. **Fankhouser unit,** Lyon and Greenwood counties, Kansas. Source: Report by Interstate Oil Compact Commission, and Production Data from Vance Rowe.

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Table I

Field	State	Type Injection	Relative Value of Primary to Secondary Recovery Daily Barrel	Average Relative Value of Secondary Recovery Daily Barrel (%)
Burnell South	Texas	Gas	2 to 4	33
Alta Mesa	Texas	Gas	2 to 3	40
Joe's Lake	Texas	Gas and Water	2	50
Bratton Unit	Kansas	Water	4.2	24
Burkett Unit	Kansas	Water	1.1 to 5.9	29
Fankhauser Unit	Kansas	Water	1.4 to 3.5	40
Patoka Benoist	Illinois	Water	2.2 to 2.7	40
Bradford	Pennsylvania	Water	.64 to 1.82	100

in balance. In order to determine a factor that would express the desired relationship, decline curves were selected at random from the literature from which both the ultimate primary and secondary recovery could be determined. *Only published results were used.*

Since the value of a property depends primarily on the amount of the reserves, the ratio of the primary reserves to the secondary recovery reserves at any given producing rate, should tell the relative value of the primary and secondary recovery daily barrel. The story told by these curves has not been confused by trying to consider the number of wells involved, either by primary or secondary producing methods.

The first curve (Fig. 2) concerns the Patoka field in Marion County, Illinois. Note the original peak production under primary methods of 2000 bbl per day, and the identical point seven years later, where the water flood started showing some increase, until it reached a peak of about 4500 bbl per day. This peak was maintained for about three years, until complete development of the flood. Notice the rapid decline. Reserves have been computed from the peak of the primary production at 2000 bbl per day, assuming no water flood was ever started, and the reserves from a comparable spot on the waterflood curve. There are about 2½ times as much reserves at the same production rate under the primary curve as that shown by the waterflood curve. Notice the three other comparable spots — at 1500 bbl per day; 1000 bbl per day; and 500 bbl per day. The relationship varies only slightly, ranging from 2.2 to 2.7 bbl of primary reserve to one barrel of secondary reserve at comparable spots on the two curves. Using this basis, then, adjustment in the base schedule for primary production should have been about 60 percent. The settlement, as aforestated, was 33 percent.

The next curve (Fig. 1) is a gas injection project on the W. W. Boyce lease in the Burnell South field, Karnes County, Texas. By using the same method, relationships of 2.04 bbl of primary reserve to every barrel of secondary recovery reserve are at the same rate of production, when the gas injection project reached its peak. The next point shows 2.11, and so on down to the bottom point where the reserves are four times as great by primary methods as secondary methods, at the same rate of production.

The next curve (Fig. 3) is, perhaps, the exception that proves the rule. This is the Bradford district water flood in Pennsylvania. This field was originally drilled in 1875, and reached its peak production about 1880. These reservoirs were produced so inefficiently during primary production that ultimate waterflood recovery is more than double primary production; however, in this extreme case, primary reserves at any given rate are only about equal to secondary recovery reserves. Therefore, it is conceded that there are a few rare cases where the secondary recovery daily barrel may be worth as much, or slightly more, than the primary daily barrel.

Please remember that the primary production phase of this field occurred before the time of petroleum reservoir engineering; whereas, during the secondary recovery phase, the most highly developed skills and technology of petroleum engineering have been applied.

There are a few more examples on the next chart, which also includes the three previously shown. This chart also shows the relative percentages over the life of the field. The Burnell South field in Texas is a gas injection project. The secondary daily barrel is worth 33 percent of the primary barrel. In the Alta Mesa field, in Texas — another gas injection project — it is worth 40 percent. In the Joe's Lake field, Texas — which is a gas and water type injection —50 percent. In the Bratton unit, Kansas — water flood — 24 percent. The Burkett unit, Kansas — water flood — 29 percent. In the Fankhouser unit, Kansas — water flood — 40 percent. And the next two, Patoka, Illinois — water flood—40 percent and the Bradford, Pennsylvania — water flood — 100 percent.

Now, what does all this prove? Doesn't it prove that, perhaps, buying our secondary recovery credits at auction sales should be stopped? Doesn't it prove that it's time to take a look at the credits that have been accepted over the past years? ★ ★ ★

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1	0	2	10.5	12.55	12.55	2.41	6:35	4:41	4:05
1	0	4	12.1	12.35	12.35	2.64	12:00**	11:42	10:22
1	500	2	11.0	12.42	12.80	2.41	6:35	4:41	4:05
1	500	4	12.6	12.23	12.50	2.64	12:00**	11:42	10:22
1	1000	2	11.4	12.35	12.95	2.41	6:35	4:41	4:05
1	1000	4	13.0	12.18	12.70	2.64	12:00**	11:42	10:22
1	1500	2	11.6	12.30	13.05	2.41	6:35	4:41	4:05
1	1500	4	13.3	12.12	12.80	2.64	12:00**	11:42	10:22
1	2000	2	11.8	12.25	13.15	2.41	6:35	4:41	4:05
1	2000	4	13.4	12.10	12.80	2.64	12:00**	11:42	10:22
½	0	2	8.5	13.30	13.30	1.89	6:30	3:50	3:40
½	0	4	9.9	13.20	13.02	2.09	10:37	10:35	8:22
½	500	2	8.75	13.21	13.45	1.89	6:30	3:50	3:40
½	500	4	10.2	12.93	13.10	2.09	10:37	10:35	8:22
½	1000	2	9.0	13.18	13.62	1.89	6:30	3:50	3:40
½	1000	4	10.4	12.87	13.20	2.09	10:37	10:35	8:22
½	1500	2	9.1	13.10	13.70	1.89	6:30	3:50	3:40
½	1500	4	10.5	12.84	13.30	2.09	10:37	10:35	8:22
½	2000	2	9.2	13.08	13.72	1.89	6:30	3:50	3:40
½	2000	4	10.6	12.82	13.30	2.09	10:37	10:35	8:22
⅓	0	2	7.83	13.70	13.70	1.71	6:00	3:30	3:05
⅓	0	4	9.2	13.38	13.38	1.90	9:52	9:41	8:00
⅓	500	2	8.0	13.61	13.80	1.71	6:00	3:30	3:05
⅓	500	4	9.3	13.35	13.40	1.90	9:52	9:41	8:00
⅓	1000	2	8.2	13.57	13.93	1.71	6:00	3:30	3:05
⅓	1000	4	9.5	13.28	13.50	1.90	9:52	9:41	8:00
⅓	1500	2	8.2	13.57	13.93	1.71	6:00	3:30	3:05
⅓	1500	4	9.6	13.25	13.60	1.90	9:52	9:41	8:00
⅓	2000	2	8.3	13.53	14.00	1.71	6:00	3:30	3:05
⅓	2000	4	9.6	13.25	13.60	1.90	9:52	9:41	8:00

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LOW density, low expansion on setting, and sulfate resistance of diatomaceous earth (DE) cement make this system potentially of value in cementing oil well casing through salt zones. Since it is common practice to use saturated salt water to slurry cement for these operations, it was necessary to determine the effect of sodium chloride on the properties of DE cements before they could be recommended in this application.

This study showed that increasing concentrations of DE in a cement slurry progressively minimize the adverse effect of sodium chloride on strength of portland cement.

Thus, with 0, 10, 20, and 40 percent DE present, the ratio of 24-hour compressive strengths (120 F) of systems saturated with salt and in fresh water was respectively 0.41, 0.51, 0.68, and 1.25. Effect of salt on thickening time of DE cement was similar to the effect on neat slurries.

Owing to the large amount of salt required to saturate all of the water used to slurry DE cement, a part of the low density advantage is lost. Even so, DE cement has a distinct density advantage over other oil well cement.

DE cement is recommended for operations involving cementing through salt zones, subject to the usual restrictions imposed upon an oil well cement.

Salt Problems

Problems associated with cementing casing set through salt formations are many and varied. These problems arise from the salt formations themselves or from formations adjacent to salt deposits. Lost circulation or thief zones are generally encountered immediately above and below salt beds and may actually exist in the salt deposit. Lost circulation can be remedied, at least in part, by using the lightest possible cement slurry. These formations may also contain soluble salts which are highly corrosive to cement and casing. For this reason it is undesirable to attempt to lighten the slurry density with an additive which would make the

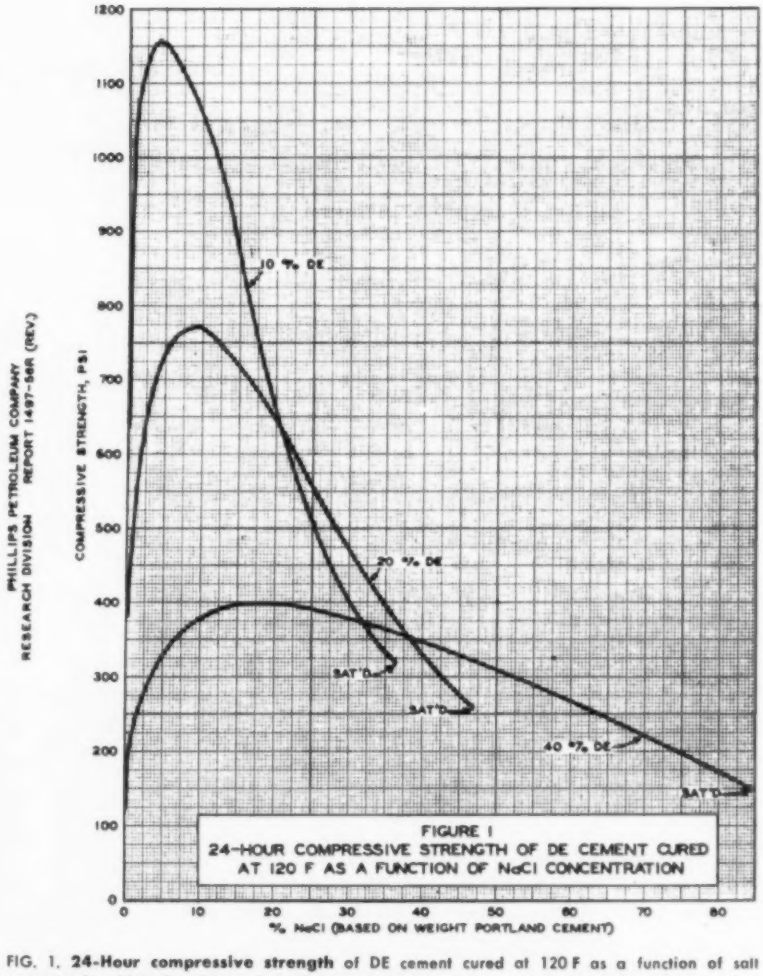

FIG. 1. **24-Hour compressive strength** of DE cement cured at 120 F as a function of salt concentration. Note that the maximum in strength is moved progressively to higher salt concentrations as the percentage of DE in the system is increased.

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cement more susceptible to attack by these corrosive materials. Additives that cause excessive expansion of the cement as it sets (alkali-aggregate reaction) should also be avoided. It is believed by some that the use of such materials in salt water cement has been responsible for casing collapse.

When cementing through salt formations with cement prepared from fresh water the salt tends to go into solution in the aqueous phase of cement slurry. When cementing through salt sections, therefore, it has become common practice to use saturated salt water to slurry the cement. To insure that any fluid which comes in contact with the salt formation is already saturated, granular salt in proper proportions is dry blended with the cement mixture. Actually in some areas sufficient salt to more than saturate the make-up water is dry blended with the cement. Fresh water is then used to slurry the cement. Either method of saturating the aqueous phase of the slurry with salt works equally well.

A Legal Angle

Some states have laws regarding the use of salt in well cements. For instance New Mexico Case No. 276, Order No. R-111-A, pertaining to setting casing in the potash areas of Lea and Eddy counties, states in Section 3. Paragraph B, "The fluid used to mix with the cement shall be saturated with salts common to the zones penetrated and with suitable proportions of, but not less than one percent calcium chloride by weight of the cement."[4]

Of the various oil well cement systems commercially available, DE cements[5] seem most ideally suited for cementing casing set through or into salt formations.

DE cements are capable of being slurried to lower densities than any other commercial system. They are highly sulfate resistant and do not expand upon setting. Highly important, however, was the unanswered question, "What is the effect of the sodium chloride on DE cement slurried with saturated salt water?" The importance of this question arises because all other cement formulations suffer losses in strength with increasing concentrations of salt above a certain concentration. This investigation was made to determine the effect of sodium chloride on the properties of DE cement.

EXPERIMENT

Materials

1. Cement: Common portland (API Class A[1])
2. DE: Special grade of diatomaceous earth used
3. Sodium Chloride

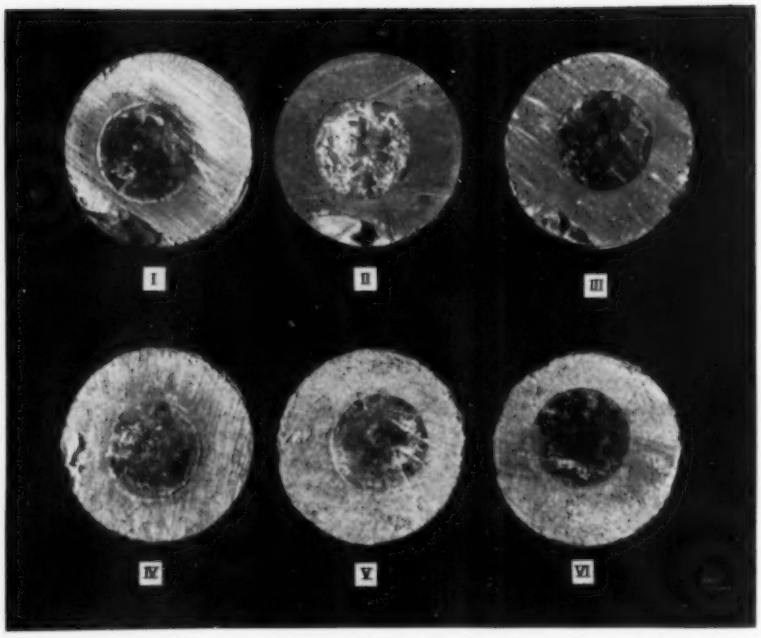

FIG. 2. **Salt cores** in different cement preparations, using both fresh and saturated salt water. Cement-filled quart pails were sealed and allowed to set at room temperatures.

Test Procedure

Portland cement was blended with other dry ingredients prior to being slurried with the desired amount of water for 35 sec in a blending machine. To insure homogeneity, all strength tests of specimens having the same composition were made from a single batch of slurry mixed in a 5-qt blender.

Concentration of various ingredients is expressed as "percent," which in this paper means parts by weight compared to 100 parts of cement. Details of some of the special equipment and procedures are described in API RP 10B.[2]

RESULTS

Ludwig[3] has investigated the effect of sodium chloride in the mixing water used to slurry neat cement. He found that:

"1. Additions of 500 to about 200,000 ppm of sodium chloride to the mixing water decreased the thickening times of the slurries of both cements (common portland and retarded).... When the concentration of the salt was 300,000 ppm, the thickening times were longer than

TABLE 1 — Density, Compressive Strength, and Halliburton Thickening Time of DE Cement Containing Sodium Chloride.

NaCl, percent	Density, lb/gal	Compressive Strength, psi: Cured at 120 F for: 1 day	3 days	7 days	Cured at 140 F for: 1 day	3 days	7 days	Halliburton 80-180-F thickening time hr:min
Part A: 40 percent DE with 220 percent water—								
0	11.05	120	720		530	670		1:33
5	11.13	330	790		790	940		1:10
10	11.22	380	890		790	870		1:10
18	11.37	400	850		720	850		1:11
84*	12.46	150	760		560	660		2:13
Part B: 20 percent DE with 130 percent water—								
0	12.13	380	1110		800	1220		1:37
5	12.27	730	1360		1140	1180		1:01
10	12.40	770	1240		1030	1140		1:08
18	12.61	680	1040		940	1080		1:14
47*	13.30	260	850		630	980		2:24
Part C: 10 percent DE with 100 percent water—								
0	12.81	630	1580		1070	1490		2:07
5	12.97	1150	1800		1260	1560		1:15
10	13.12	1060	1660		1370	1470		1:15
18	13.38	750	1260		1020	1230		1:23
36.5*	13.90	320	800		510	860		2:31
Part D: Neat Class A cement with 46 percent water—								
0	15.67	3550	4050	6550	4330	5700	6850	0:55
5	15.88	3780	4100	5400	4190	4300	4990	0:38
10	16.10	3100	4240	4700	3640	4160	4600	0:50
18*	16.47	1470	2020	3370	1780	2840	3180	1:07

* Sufficient salt to more than saturate the mixing water.

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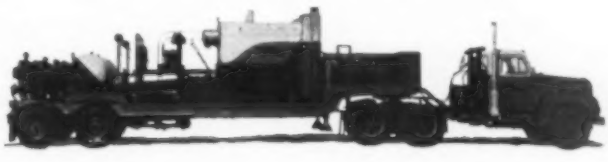

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those of the slurries containing no sodium chloride. . . .

"2. In general, the compressive strengths at 24-hours of 2-in. cubes of Type I cement slurries cured at 100, 120, and 140 F increased with increasing salt content of the mixing water up to the concentration of 30,000 ppm, and then decreased as the salt concentration was further increased."

In this study the salt was dry blended with cement and the concentrations expressed in terms of the cement weight rather than ppm of the mixing water. The results for neat cement (Table 1, Part D) are in excellent agreement with those of Ludwig.[3] When cured for 24 hours at 120 F neat cement containing enough salt to saturate the make-up water (18 percent) was only 41.5 percent as strong as the same cement containing no salt.

Salt-Laden Cement Strength

Due to the large amounts of water in DE cements, saturation with salt results in a high weight ratio of salt to portland cement. This high ratio might be expected to reduce seriously the strength of DE cement. Such was not the case.

Regardless of the curing temperature, the 24-hour compressive strength of 40 percent DE cement prepared with saturated salt water is stronger than the same cement system prepared with fresh water (Table 1, Part A). When the 24-hour strengths of 2-in. cubes cured at 120 F were compared, as in the case of the neat cement, the 40 percent DE cement made from saturated salt water was 1.25 times as strong as that made from fresh water. This ratio, to be referred to as the 120 F saturated salt-strength ratio, was 0.41, 0.51, and 0.68 for the 0, 10, and 20 percent DE systems, respectively.

It is apparent that the addition of DE to cement decreases the detrimental effect on the compressive strength resulting from using saturated salt water to slurry the cement. In fact, the incorporation of sufficient amounts of DE in portland cement slurries actually reverses the effect of saturated salt water on the compressive strength.

Leveling Effect

Plots of 24-hour compressive strength as a function of the concentration of sodium chloride in various DE cement systems show the leveling effect by DE (Fig. 1). In these plots there is a given percentage of salt where both the 20 and 40 percent DE cement systems exhibit greater strengths than the 10 percent system. These percentages, of course, are based

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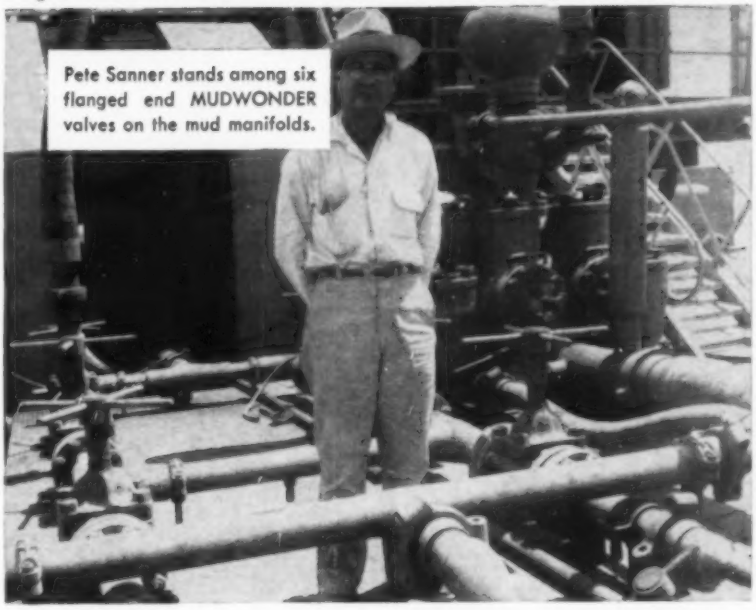

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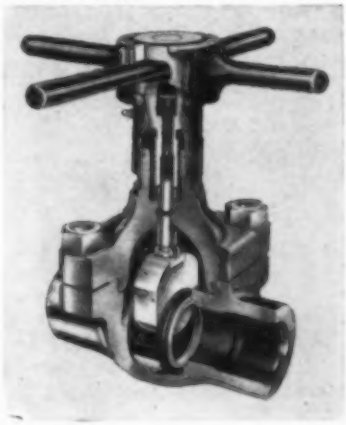

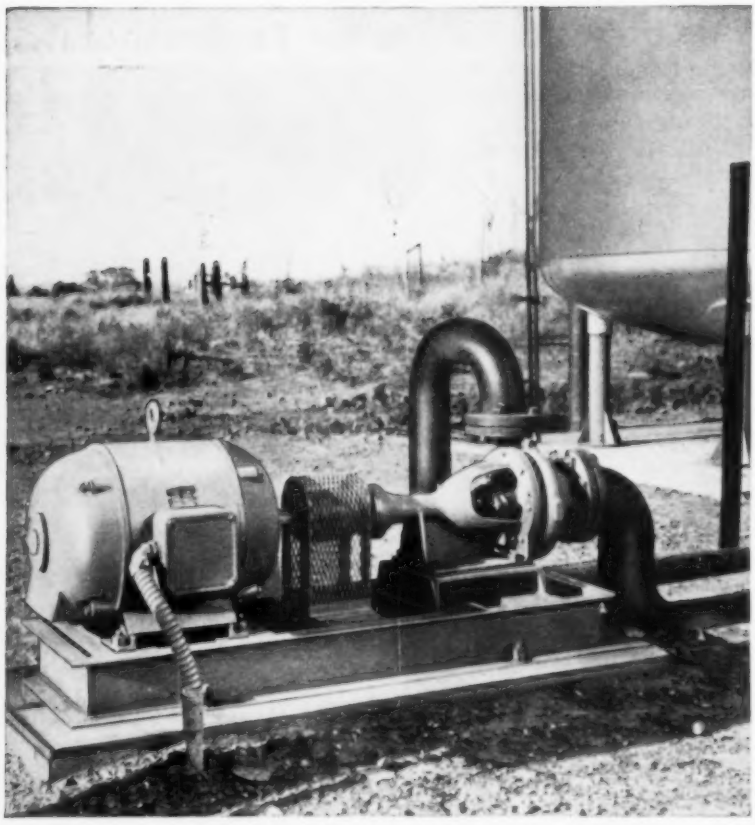

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on the weight of dry cement. If the salt concentrations were expressed in parts per million of the make-up water, the curves would not cross. The leveling effect of DE on high salt concentrations would still be apparent, however.

Strength Characteristics

Ludwig[3] described the 24-hour strength characteristics of neat cement as a function of sodium chloride concentration (see above). The same general curves describe the strength of the salt-DE cement systems (Fig. 1). Ludwig found the maximum strength of neat cement at a concentration slightly less than 30,000 ppm or at a little more than one percent sodium chloride. The strength of 10 percent DE cements reach a maximum at about 4.5 percent or around 45,000 ppm salt.

The maximum in strength is moved to progressively higher salt concentrations as the percentage of DE in the system is increased.

No attempt was made in this study to cure DE cements for periods of longer than three days. Neat cement was cured for seven days. No anomalies were noted and none are to be expected with the DE systems.

Halliburton thickening times determined over the temperature range 80 to 180 F showed that both neat and DE cements are accelerated by small amounts of salt and retarded by saturated salt water. Here the shape of the curves of thickening time as a function of salt concentration is more similar than the shape of the corresponding strength curves. The leveling action of the DE is not so noticeable in this property.

Test Variations

It is realized that Halliburton thickening times are not as reliable as pressure thickening times; however, sufficient data are available in the literature to permit the use of this more convenient test. DE cement was designed to be used to the same temperature or depth limits as neat or gel cements even though it has slightly greater thickening times. Since comparable data are given for neat cement, it is to be expected that the usable limits for the DE cement systems are defined. In addition, the pressure thickening times are available for DE cement systems containing no sodium chloride.[5] These data along with the Halliburton thickening time data, to give the shape of the curve, provide ample information for the successful application of DE cement containing sodium chloride.

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Since large amounts of water are used in DE cement slurries, large quantities of salt are required to saturate the systems. The lower the slurry density the greater the amount of salt necessary. Thus, some of the density advantage of the DE cement system is lost. Even so, these slurries are still the lightest available at the present time.

Leaching Effect

It was noted that the filtrate from fresh water cement tends to leach salt formations. This is illustrated in Fig. 2. Cement slurries, prepared with fresh and saturated salt water, were poured around 2-in. salt cores in quart pails. The pails were sealed and the cement allowed to set for one week at room temperature. The hardened cement containing the core was cut to expose a cross section perpendicular to the longitudinal axis of the salt core. The specimens in Fig. 2 are identified as follows:

No.	DE Percent	W/C Ratio	Type Water	Salt Added To
I	none	.46	Fresh	—
II	none	.46	Sat'd salt	water
III	none	.46	Sat'd salt	cement
IV	40	2.20	Fresh	—
V	40	2.20	Sat'd salt	water
VI	40	2.20	Sat'd salt	cement

The two specimens prepared from fresh water (I and IV) have a ring of soft cement around the salt core. If hand pressure is applied to these salt cores they can be moved.

The cement prepared with saturated salt water made a good bond with the salt regardless of whether the salt was dry blended with the cement or dissolved in the make-up water.

The Author

Francis J. Shell is a senior research chemist in the production branch of the research division, research and development department, Phillips Petroleum Company. He was graduated from Fort Hayes Kansas State in 1949 with a M.S. degree in physical chemistry and from the University of Kentucky in 1952 with a PhD in physical chemistry. He served in the military forces from 1942 to 1947 and is presently a captain with the Air Force Reserve. His employment with Phillips started in August of 1952. His research work with Phillips has been on chemical problems of oil production, with main emphasis on new oil well cement formulations.

CONCLUSIONS

DE when added to cement acts as a leveler. As such it levels out the effect of sodium chloride upon slurries in which it is incorporated. This means that DE cement, which is so well suited for cementing through salt zones in every other way, is not adversely affected by the addition of sodium chloride to the cement slurry.

Of special interest is the ratio of the 24-hour compressive strength of fresh water and saturated salt water cement. This saturated salt-strength ratio is 0.415 for neat cement, and 0.51, 0.68 and 1.25 for 10, 20, and 40 percent DE cement, respectively.

The addition of salt has the greatest adverse effect upon the density of the lightest slurries. Even so, DE cements have a distinct density advantage over other oil well cements.

DE cement can be recommended for cementing operations through salt formations. This recommendation is of course subject to the usual restrictions placed upon oil well cement.

References

1. API Std. 10A, "Specification for Oil Well Cements," Second Ed., API Division of Production, Dallas, Texas, March, 1955.
2. API RP 10B, "Recommended Practice for Testing Oil Well Cements," Fourth Ed., API Division of Production, Dallas, Texas, May, 1955.
3. Ludwig, N. C., *Oil & Gas Jour.* 59, 125 (May 24, 1961).
4. New Mexico Case No. 276, Order No. R-111-A.
5. Shell, F. J., Hurley, J. R., Bergman, W. E., and Fisher, H. B., *World Oil*, 143, 131 (September, 1956).

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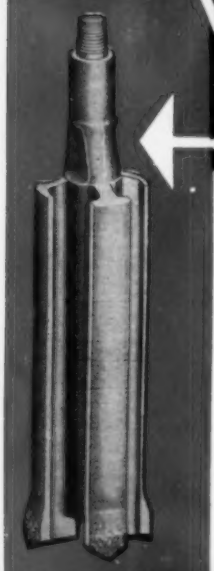

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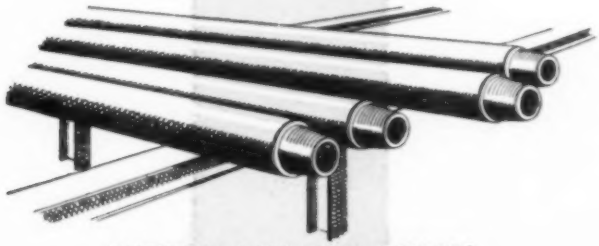

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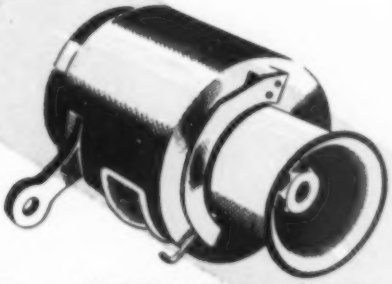

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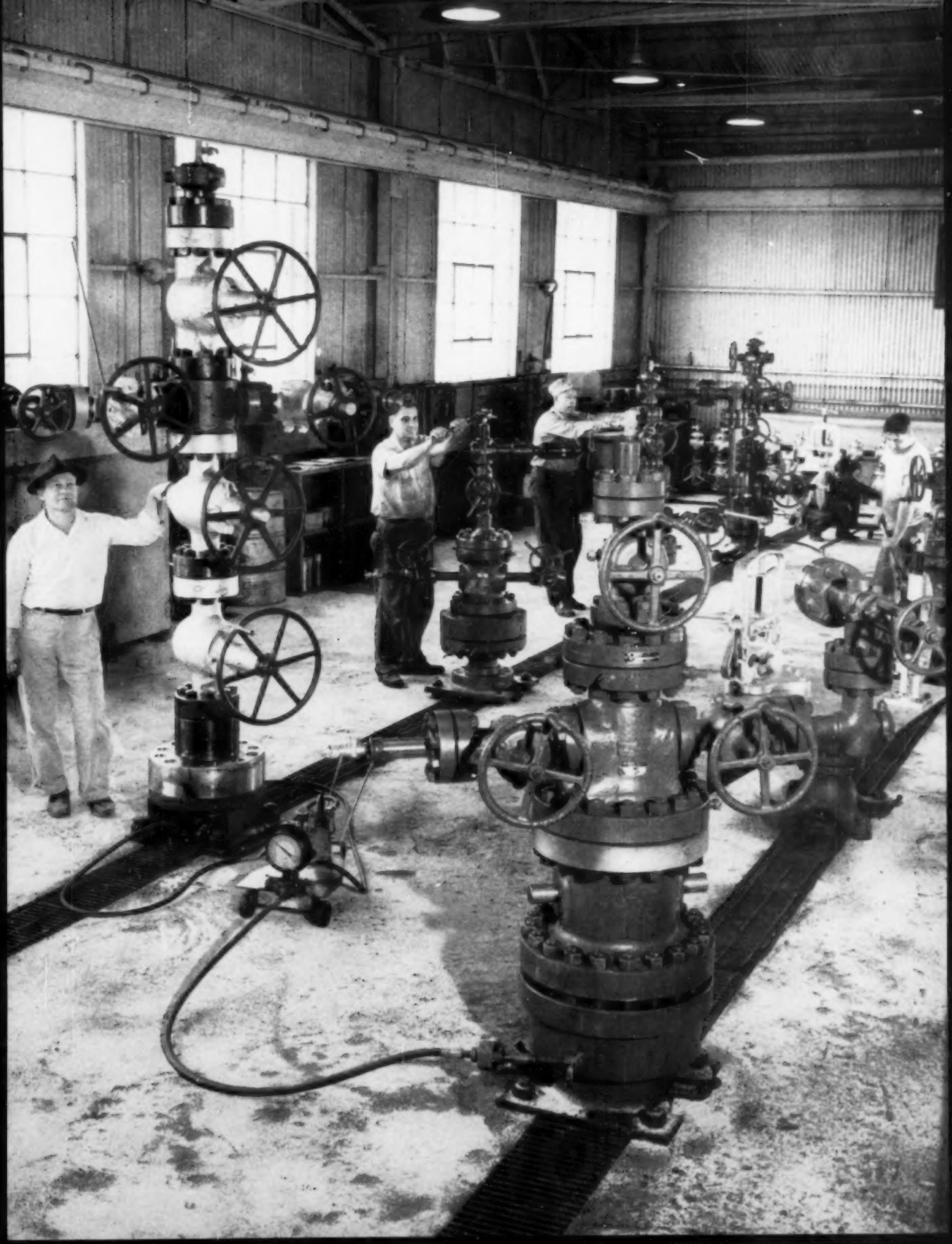

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And one big reason why O-C-T equipment proves its mettle in the field is because the equipment is proven in the shop first.

O-C-T testing facilities in the Houston headquarters plant simulate field conditions.

That's why when you buy O-C-T you buy equipment that has been proven.

Testing is an important part of all-encompassing O-C-T service.

Whether it's a complete 30,000 pound test Tree, a casing or tubing head, flange, choke or gauge, O-C-T has its own gauntlet to prove the product's mettle.

That's why you install O-C-T equipment with an assurance it will work—for it has worked before.

O-C-T tests all the way down the line.

There are tests for new designs.

There are tests for equipment making its debut and for equipment that has been refurbished.

O-C-T is test conscious.

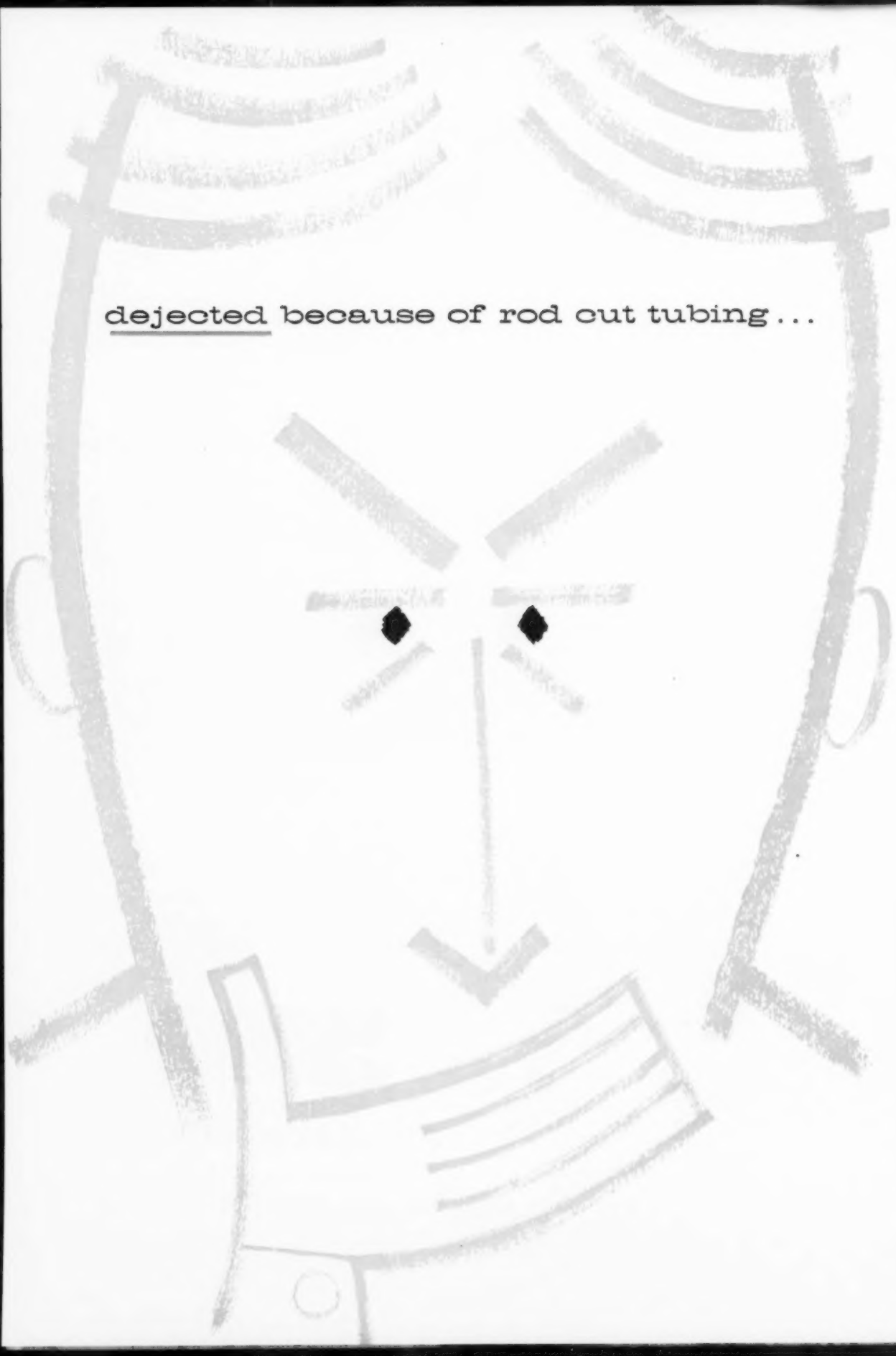
An O-C-T product goes out of the shop prepared and ready for the biggest test—the field test.

O·C·T

OIL CENTER TOOL CO.

Export Representatives: South America — East West Oiltools, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

dejected because of rod cut tubing...



FOR TUBING PROTECTION

specify

oilmaster

SUCKER ROD GUIDES

OILMASTER Sucker Rod Guides are used as a means of centering the sucker rod string in the tubing—eliminating wear on the rods and couplings—minimizing and distributing the wear on the tubing.

They are designed with the fluid passage in the form of a helix, with the bearing areas overlapping to give the effect of a continuous smooth bearing surface against the tubing. The annular clearance plus the area of the passages provides a liberal area for fluid to flow past the guide.

The wear surfaces of the OILMASTER Sucker Rod Guides are faced with a thick coating of Colmonoy—a torch-applied hard facing material that possesses an exceptionally low coefficient of friction against the relatively soft steel of the tubing. The fact that it is possible to obtain both a low coefficient of friction and a high wear value is explained by the micro-structure of the Colmonoy material. It is composed of hard crystals of Boron and Chromium in a nickel matrix. Under microscopic examination, these crystals assume an exceptionally smooth overlapping pattern—presenting a surface which will slide readily over a mating surface with no tendency to seize and a minimum of frictional drag.

FLUID PACKED PUMP CO.

Main Office and Plant, Los Nietos, California

Distributed by the National Supply Co., Pittsburgh, Pa.
Export: The National Supply Co., Export Division,
600 Fifth Avenue, New York
Co-Distributors: Union Supply Company,
Beacon Supply Co., Industrial Supply Co.

New ¾" Rod Box in 2½" tubing. Note comparatively small contact area.

Worn ¾" Rod Box in worn joint of 2½" tubing. Note how wearing away of a small amount of metal has made joint dangerously thin.

OILMASTER Rod Guide in new joint. Note large contact area which reduces and distributes wear.

Illustration shows application of OILMASTER Sucker Rod Guide with ¾" sucker rods in 2½" tubing as it replaces a coupling in the sucker rod string.

RIGHT DOWN OUR ALLEY

This is "pipe alley" in a large Midwestern refinery. It is made up of connecting lines between refinery units and storage tanks. Such "pipe alleys" are highly practical to a refinery since all the pipe is confined to one area, and the lines are kept above-ground where they are easily accessible for inspection and maintenance.

Over 70,000 feet of the pipe in this alley is NATIONAL Seamless, "Walls Without Welds," 12¾-inch O.D. with .375-inch wall.

* * *

Refinery pipe and tubing problems are "right down our alley." We manufacture NATIONAL Seamless Pipe and Tubes in over 2 dozen different steel analyses, each designed to counteract specific refinery problems such as corrosion, oxidation, pressure and temperatures. Other chemical compositions are also available in tubular products, and at the present time, a wide variety of high temperature problems is under study.

If you have a refinery tubing problem, we'd like to give you a hand with it. We have a technically trained Mill Service Force available to you for technical and operating assistance in meeting your tubular requirements. This Force is also available for consultation in the field. We'll see that you get the right tubing for the job, at the lowest cost. Write to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

TWO DOZEN DIFFERENT NATIONAL TUBE ANALYSES:

Carbon	5 Cr, ½ Mo	17 Cr
Carbon, ½ Mo	5 Cr, ½ Mo, 1½ Si	18-8
1 Cr, ½ Mo	7 Cr, ½ Mo	18-8 Ti
1¼ Cr, ½ Mo	8 Cr, ½ Mo	18-8 Cb
2 Cr, ½ Mo	8 Cr, 1 Mo	18-8 Mo
2¼ Cr, 1 Mo	9 Cr, 1 Mo	25-20
2½ Cr, ½ Mo, ¾ Si	12 Cr	3½ Ni
3 Cr, 1 Mo	12 Cr, Al	5 Ni

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

NATIONAL SEAMLESS PIPE AND TUBES

WALLS WITHOUT WELDS

UNITED STATES STEEL

FIG. 1. **Large fracturing jobs,** like the Hardwicke-Sunkel operation, require large amounts of water in the backwash pit, in tanks, and emergency connections to the water treating pit. On the Sunkel job arrangements were made to deliver 140,000 bbl of water at the rate of 81 bbl per min.

P 530.2

Opening salt water disposal well with 87,000 lb of sand, 140,000 gal of water at . . .

BIG FRAC IN EAST TEXAS

. . . Opens new water injection capacities, new realm for hydraulic fracturing operations

EFFECTIVENESS of a large hydraulic fracturing job performed recently in an East Texas salt water disposal well has prompted new high-capacity fracturing in the area. Several outstanding successes have been noted.

First big job, and thus far the largest, was on the East Texas Salt Water Disposal Company's Sunkel 1-A well — Hardwicke system. Injection of 87,000 lb of sand and 140,000 gal of water was pumped into the Woodbine sand formation increasing the well's salt water "take" from 3 or 4 bbl per min at 400 psi, to 13 bbl per min at 30-in. vacuum at the wellhead. Fracturing job was completed July 20, 1956, and the well is still taking fluid at approximately the same rate at last report.

Low-Input Well

The Hardwicke-Sunkel 1-A well was completed in October, 1955, with an initial injection rate of less than 2 bbl per min by gravity. At this time it was acidized with 1000 gal of mud acid and swabbed clean. Since this treatment did not improve the input rate, pump pressure was applied. Initial injection rate by pump was 6 bbl per min at 400 psi. The rate gradually decreased to 3 to 4 bbl per min at 400 to 450 psi.

It was suggested by engineers engaged to do the fracturing job that the well be plugged back to the base of the Woodbine with sand and a 5 gal plastic cap, so that the Woodbine section would receive all the fracture.

Actual fracturing treatment was planned to consist of 100,000 lb of sand blended with 100,000 gal of filtered salt water pumped into formation under high pressure at a high rate. It was decided that the first 5000 gal of the mixture would be gelled as a precaution against a screen-out.

Pre-Frac Procedure

Before beginning the job, a wire line measurement was run, hitting bottom at 3663 ft. Original total depth of the well was 3712 ft, indicating a fill of 49 ft. A bailer was run and spudded several times, but no footage was made. Since the fill came to 3663 ft and the base of the Woodbine was 3662 ft, it was decided that the fill under the plastic plug would not be used. Four gallons of plastic material were placed in the hole and allowed to set 18 hours. Measuring line was then run, and the top of the plug was located at 3659 ft — 3 ft above the base of the Woodbine. Casing seat was 3624 ft, leaving 35 ft of 5⅛-in. open hole available for fracturing.

Casing in the hole was 7-in. OD, 23-lb, J-55 pipe cemented from bottom to top.

Frac Equipment

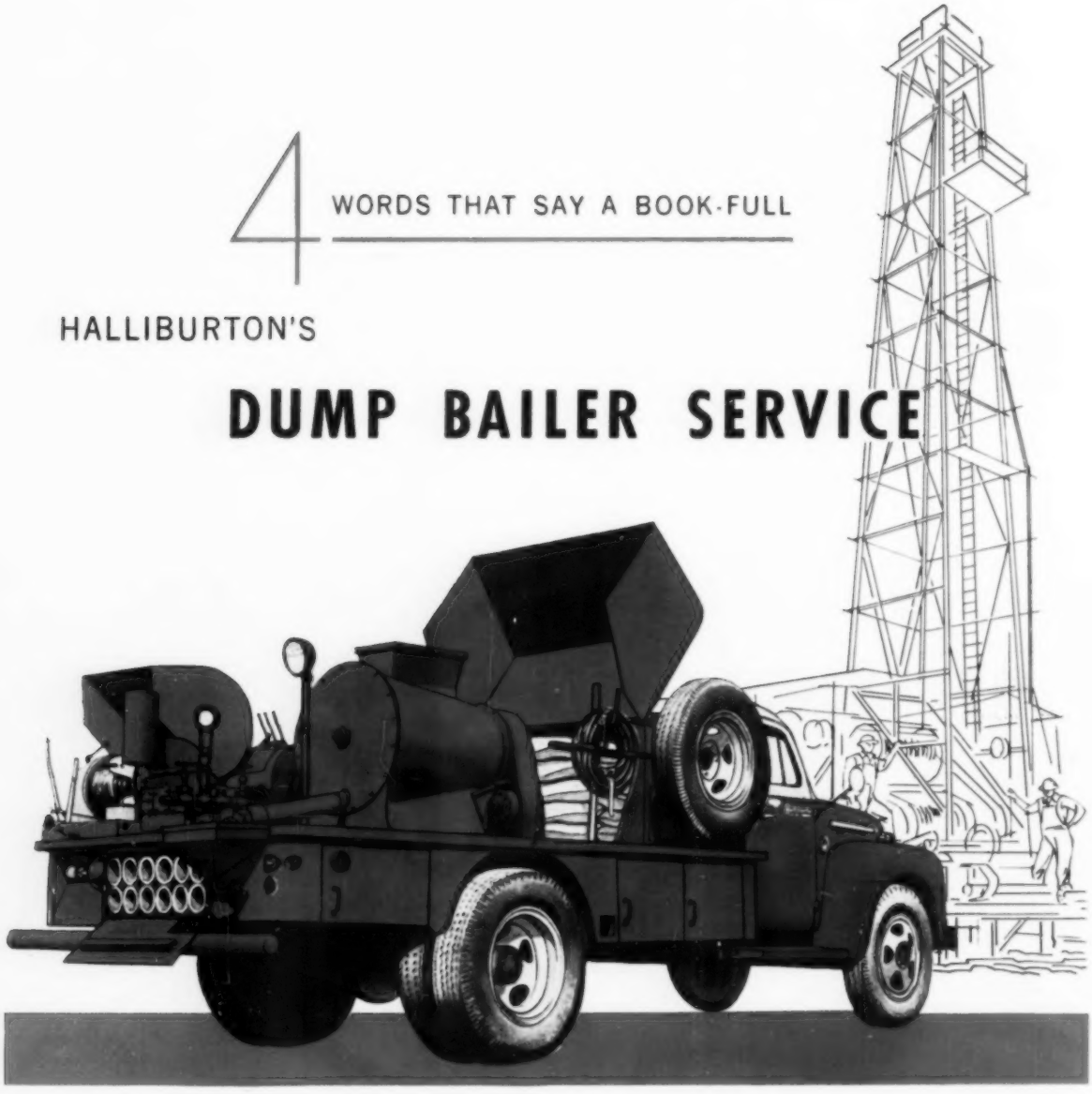
Fracturing equipment included two blenders, each with a capacity of 55 bbl per min, four 25,000 lb sand trucks, six 613 hp pump trucks with a combined pump capacity of 66 bbl per min, and four 10,000 gal water tanks.

Prior to the job, the backwash pit was cleaned and filled with filtered salt water. Four 4-in. and one 3-in. rotary pumps were used to take suction from this pit and deliver water to the 4 water tanks, positioned near the pumping trucks.

4 WORDS THAT SAY A BOOK-FULL

HALLIBURTON'S

DUMP BAILER SERVICE



Here's a complete, smoothly integrated service, developed through 16 years of experience in remedial operations, that can save you valuable time and cut the cost of shot tamps, plug-backs, bridge plugs for pipe repairs, securaloy removal and other odd-jobs encountered in remedial work.

When you specify Halliburton's Dump Bailer Service, these four words bring you the valuable benefits of Halliburton's developments in equipment and techniques. Placing gravel has been simplified. New equipment, using a special stuffing box and quick-change head, permits the operator to apply pressure for squeezing materials into formation or for other purposes while the bailers remain in the hole. Small Knife-Type Bailer bottoms make it possible to perform Dump Bailer techniques inside tubing.

HALLIBURTON DB BRIDGING BASKET

Makes remedial work off bottom of open hole or inside casing more economical. Attached to Bailer section by special adapter, it is lowered to any depth in open hole or casing with quick-setting materials in the Bailer, ready to be dumped. A slight pickup of the Bailer sets and opens the Bridging Basket and dumps the material simultaneously.

CAL-SEAL

A super-strength gypsum cement, manufactured and mixed with chemicals to insure a stabilized controlled set. Setting time can be accelerated or retarded to meet special conditions. Expansion upon setting produces a tight plug. Low permeability effectively keeps out unwanted gas or well fluids.

HYDROMITE

A proven waterproof plastic base gypsum cement. Unlike a regular cement slurry, the fluid phase of Hydromite contains a resin that sets up when squeezed out into the formation. Penetration is brought about by applying a differential pressure of 50 to 60 psi on the material when it is in contact with a porous permeable formation. This feature, plus expansion at time of initial set, makes Hydromite a superior, non-permeable plug for plugging off bottom hole water in producing wells.

RESIN-CEMENT

A blend of resins, water and portland cement, designed for open bottom hole plugs, setting around casing shoe or opposite water zones and other remedial work in oil or gas wells where ordinary cementing materials fail. Dump Bailers are used to place Resin-Cement in small volume or when it is not practical to pump through tubing. The set Resin-Cement is not attacked by oil, gas or formation water and will resist the action of common acids.

Don't put off the remedial work needed to make your well a better . . . more profitable producer. Halliburton Dump Bailer Service is fast, versatile, effective and economical. Call the local or district office or write the Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

ASK FOR THE "DUMP BAILER SERVICES" BULLETIN

HALLIBURTON OIL WELL CEMENTING COMPANY

CEMENTING SERVICES

251 SERVICE CENTERS — JUST MINUTES AWAY FROM ANY RIG

FIG. 2. **Fracturing equipment** for large jobs involved using two blenders (linked to manifold connecting water tanks), locating two 25,000 lb sand dump trucks by each blender, then connecting pump trucks, shown here, to the discharge of each of the blenders.

When the layout was complete, 100,000 gal of filtered salt water was in the backwash pit, 40,000 gal in tanks and emergency connections to the water treating pit were provided. Sufficient pump capacity to move water into the tanks at a maximum rate of 67 bbl per min was provided. In addition 14 bbl per min could gravitate through the filters and into these tanks, making a total 81 bbl per min with all pumps and filters in operation. A wide margin of safety was provided so that a breakdown of any unit would not affect the total operation. A 4-in. rotary pump and an additional 4-in. centrifugal pump were set on the header section of the treating pit. Four-inch discharge lines were laid from each pump to the tanks.

Tank Connections

Tank connections were set up in this manner: Tank 1 — two 4-in. pumps and one 3-in. pump taking suction from backwash pit; Tank 2—one 6-in. gravity line directly from the clear tank (this was the tank containing the gel); Tank 3 — two 4-in. pumps taking suction from the backwash pit; and, Tank 4 — one 4-in. centrifugal pump and one 4-in. rotary pump taking suction from the header section of the treating pit.

Fracturing Truck Set-Up

Fracturing equipment was tied into the storage tanks in the following manner.

Each blender was linked to a manifold connecting 2 of the tanks. Two 25,000 lb sand trucks were located for use by each blender. Three pump trucks with a combined maximum pump capacity of 33 bbl per min were connected to the discharge of each of the 2 blenders. Three discharge lines were laid from each of the two groups of trucks to the well.

Actual fracturing job on the Hardwicke-Sunkel well was done on the afternoon of July 20, following nearly 3 days of preparation.

Operation Procedure

Following testing and trial pumping to establish rate and pressure, set at 57.5 bbl per min at 1200 psi, a total of 5000 gal of gelled water (50 lb gel to 1000 gal salt water) was pumped down at the rate of 13.3 bbl per min at 600 psi pressure prior to sand fracturing.

All 6 pumping trucks pumped salt water, immediately blending 20-40 mesh sand at ½ lb per gal. Initial pressure was 1200 psi at the rate of 57 bbl per min. Sand was immediately increased to a 1 lb per gal blend, with pressure at 1250 psi. After pumping 30 min, sand blend was decreased to ¾ lb per gal. Pressure at this point was 2000 psi, pumping at rate of 52.5 bbl per min. Six minutes later, with pumping rate decreased to 42 bbl per min, sand injection was stopped and started flush. In 3 minutes pressure had increased to 4200 psi, pumping rate had diminished to zero.

When pressure had increased to 2900 psi, it was apparent that the sand was beginning to screen. It was estimated that 80 bbl of flush were used before the well plugged. Based on 10,000 lb of sand left in trucks and 3000 lb screened out in the well, it was estimated that 87,000 lb of sand were injected into the formation.

Bailing Operations

The following day, a cable tool rig was moved in and wire line measurement determined bottom of hole to be at 3527 ft, indicating a fill-up of 132 ft. Fracturing sand was bailed for 3 days cleaning the hole to 3657 ft, when hole began caving and footage was lost. Following day bailing operations ceased after footage was lost to 3650 ft. Woodbine sand and conglomerate were being removed continuously. A

TABLE 1 — Salt Water Injection Well Treatments.

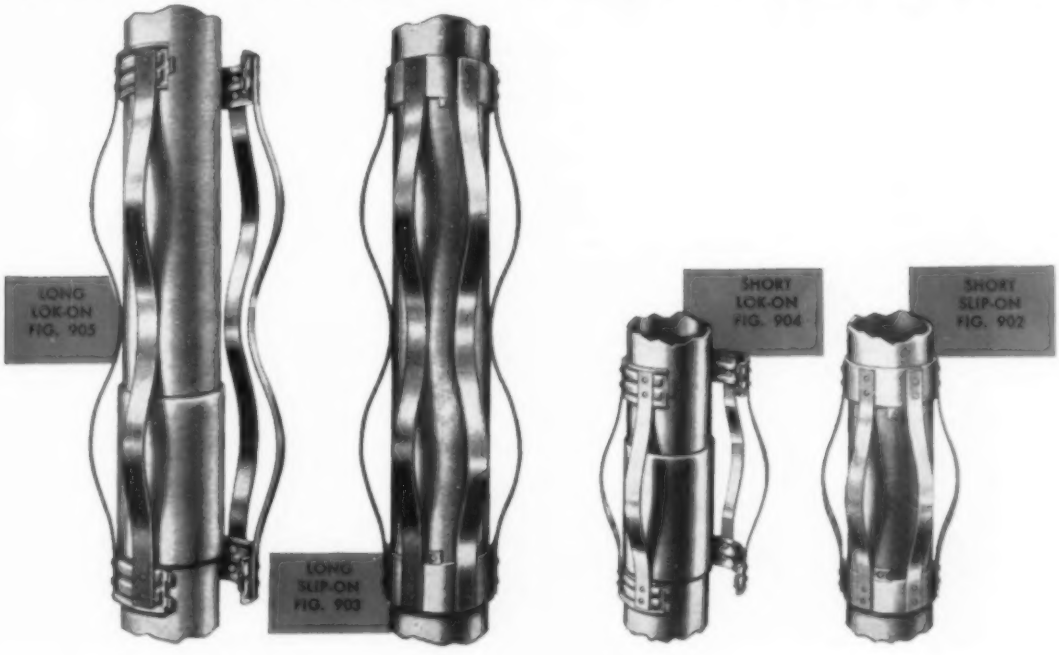
Well	Date Treated	Treating Materials	Average Pump Rate	Average Injection Rate Before Treatment	Average Injection Rate—1-14-57
A	7-20-56	5000 gal gelled water 3300 bbl salt water 90,000 lb sand	54 bbl/min	6900 bbl/day at 400 psi	11,500 bbl/day* on vacuum
B	12-4-56	5000 gal frac acid 2490 bbl salt water 50,000 lb sand	62 bbl/min	6000 bbl/day at 350 psi	10,000 bbl/day* on vacuum
C	10-24-55	7000 gal gelled water 300 gal thickened Kerosine Temporary plug 13,000 lb sand	11 bbl/min	180 bbl/hour	360 bbl/hour
D	11-17-56	7500 gal gelled water 300 gal thickened Kerosine Temporary plug 10,000 lb sand	10 bbl/min	157 bbl/hour, avg at 200 psi, avg	130 bbl/hour* on 28-in. vac
E	11-2-56	9900 bbl salt water 34,000 lb sand	45 bbl/min	0 8 bbl/min gravity flow	4 4 bbl/min gravity flow
F	1-7-57	30,000 gal gelled water	60 bbl/min	Operator not injecting into well as of 1-14-57	

*Maximum injections capacity not available
Formation is the Woodbine Disposal, East Texas

FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD

LARKIN

EXCEEDS EVERY KNOWN REQUIREMENT FOR CENTRALIZER PERFORMANCE



The double-bow design of the Long Larkin Centralizer, in both the Slip-On and Lok-On Types, gives you the maximum in centralizer performance.

Based on established standards these centralizers

Take 45% less permanent set than maximum allowed*
Exert 300% more initial centering force than minimum required*

FIVE RANGES

Each of the four different types of Larkin Centralizers come in five different ranges. Therefore, there is a Larkin Centralizer "tailor made" to give maximum performance in any casing/hole size combination. The "tailor made" feature also assures easy starting at all times.

The Short Larkin Slip-On and Lok-On Centralizers fill the requirements of efficiency and economy in shallower areas or on short strings in undeviated holes.

*Certified by an independent engineering firm which tested Larkin Centralizers after an extensive survey of Oil Company standards for centralizer performance.

LARKIN
...Through Your Supply Store

PESA

LARKIN PACKER COMPANY, INC.,
WAXAHACHIE, TEXAS

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

Still on the job after 9 years with

MARVEL INVERSE OILER—

Vital Part of World's Finest Engines

The Marvel Inverse Oiler ⟶

is an integral part of the Waukesha NKRU gas unit. Operating off the intake manifold, this completely automatic Oiler feeds Marvel Mystery Oil exactly in proportion to engine loads . . . gives direct protection to the all-important upper cylinder areas.

STILL ON THE JOB after *nine years'* service! This dependable Waukesha NK Series engine, pictured above, has *never* had the head or pan off in all this time.

Like most fine performers, the Waukesha engine is equipped with a Marvel Inverse Oiler for Marvel Mystery Oil—finest performing lubricant on the market.

For engine manufacturers have found that engines equipped with Marvel Inverse Oilers, can be depended upon to give quick acceleration to save trip time . . . keep operating costs to a minimum . . . guarantee hours of continuous performance . . . keep "down time" low by extending periods between overhauls.

The Marvel Inverse Oiler, incorporated as a vital unit in the engine's lubrication system, feeds Marvel Mystery Oil in exact proportion to engine speed and load . . . properly lubricating valves and guides, preventing wear and sticking. It keeps upper piston rings free in their grooves . . . retards ring flutter . . . and cushions ring pounding which can result in ring breakages.

Of course, it is actually the oil that performs these functions and only Marvel Mystery Oil is blended for this purpose and for the Marvel Inverse Oiler!

See Your Local Jobber or Oil Well Supply House

EMEROL MFG. CO., Inc.

242 West 69th Street
New York 23 N. Y.

REFLECTIONS OF AN OLD-TIME DRILLER

Martin-Decker weight indicators and Ideal wire line anchors are sold through the Reed Roller Bit Co., the National Supply Company, and other reorganized supply houses, as well as by the Martin-Decker Corp., 3431 Cherry Ave., Long Beach 7, Calif.

"Yeah, you're right, Jimmy, there sure are a lot of gauges to watch, but they're all necessary if you want to make hole fast and if you don't want to spend a couple days fishin'. And I don't mean for speckled trout.

"I remember 35 years ago when I was a weevil like you, you didn't see too many weight indicators on the old wooden rigs. And those you did see were pretty crude. That's probably why they didn't catch on so fast. Another reason was that a lot of the old-time drillers thought they were real hotshots who could drill by the seat of their pants.

"But a lot of things went haywire. Those guys were twistin' off their drillpipe like so much macaroni. They were drillin' crooked holes that snaked all over the oil patch. Sometimes they even bumped into one another. Something had to be done.

"In the late Twenties Martin-Decker came out with a weight indicator that was pretty good for its day. Simple enough. Just a hydraulic gauge that hung on the dead line. Later they built one that used copper tubing to connect the diaphragm on the dead line to a gauge right in front of the driller. But even that was a far cry from this Martin-Decker Type "D" drilling console standing in front of us here.

"This is the most accurate and dependable weight indicator anyone's come up with yet. It gets its hydraulic signal from an outfit called a 'Sensater,' which is locked into the Ideal wireline anchor. Remind me to take you under the rig and show you how the Sensater works. It's a clever gadget. It strokes just like a piston but – well, I'll show you later.

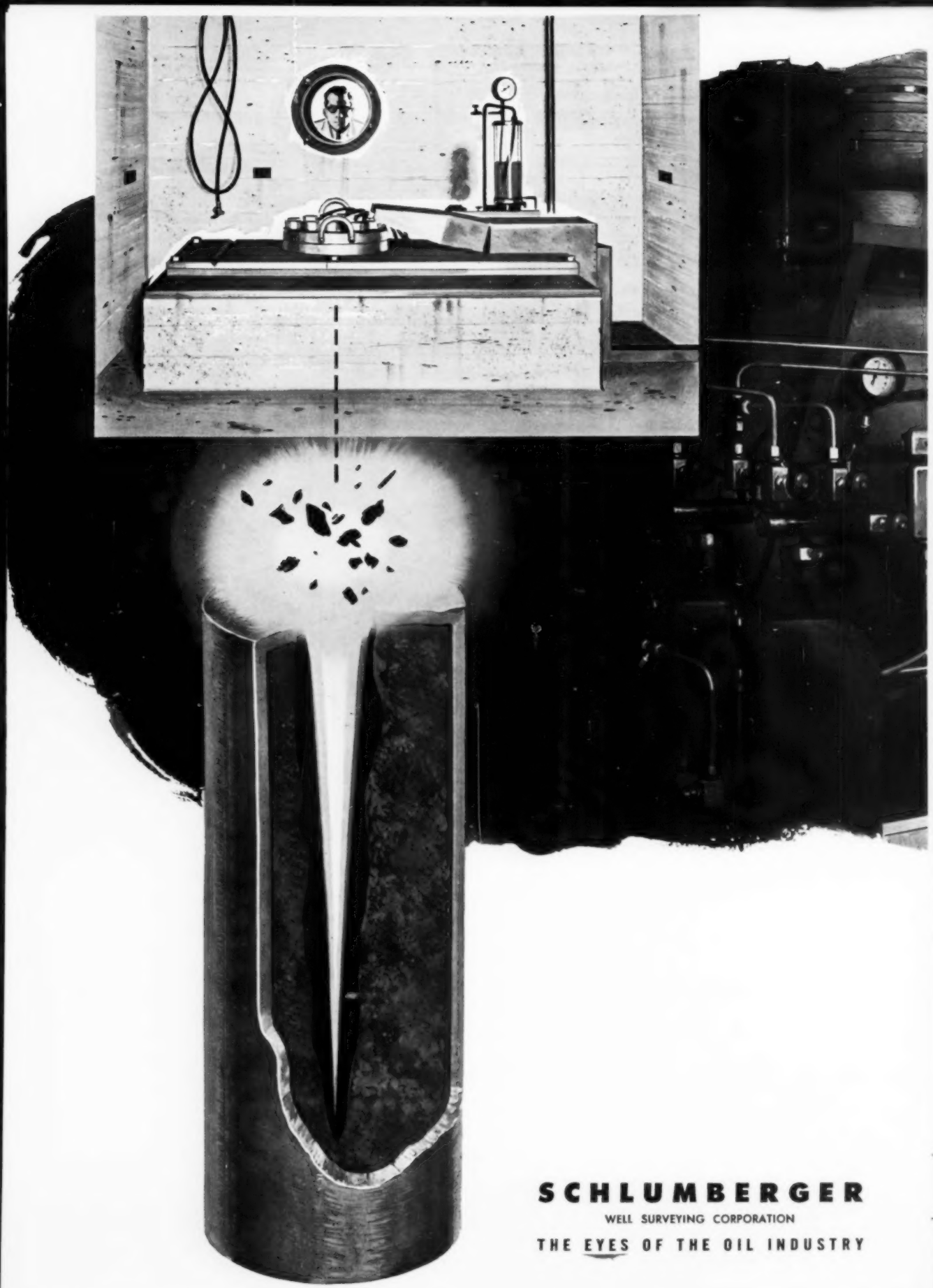
"The weight indicator has two pointers and two dials and shows the total drill-string weight and the net weight on the bit. The mud gauge tells you if you're getting enough pressure and circulation, the torque gauge tells you how much twisting power you're putting into your bit, the tachometer tells you how fast your rotary table is turning. A recorder makes a written record of the whole operation.

"New stuff comes out every year. Now they have electric recorders that can make a history of a job a long way off. They also have electric tachometers for rotary speed, pump pressure, and engine RPM. The ones I've seen are really slick. I'll sure be glad when they're standard equipment on all rigs – and they will be someday, mark my words.

"Yes sir, Jimmy, when you get to be a driller someday, all you'll have to do is push a mess of buttons to drill a whole oil well. But there'll be Martin-Decker instruments in front of you to tell you which buttons to press."

MARTIN-DECKER CORP.

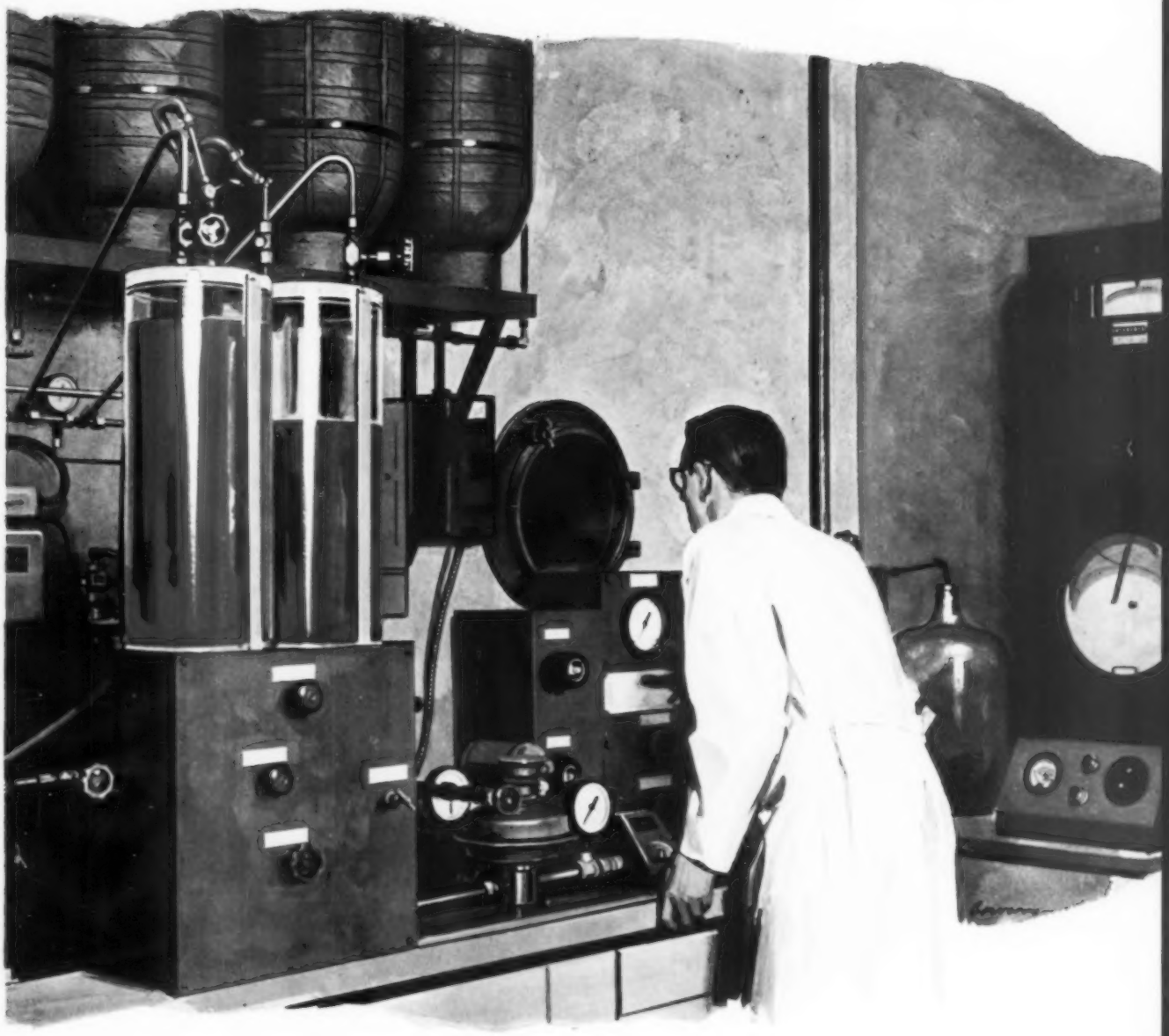
HOME OF THE WEIGHT INDICATOR — LONG BEACH, CALIFORNIA



SCHLUMBERGER

WELL SURVEYING CORPORATION

THE EYES OF THE OIL INDUSTRY



New from Schlumberger ---
MAXIMUM FLOW PERFORATIONS

The new Schlumberger flow index laboratory provides the most complete gun testing facilities in the oil industry today. It is the first and only laboratory of its kind being operated by a service company.

In the past, Schlumberger has tested gun performance under extremes of pressure and temperature. Now, it is also possible to fire guns under formation-to-hole pressure differentials identical to those existing underground.

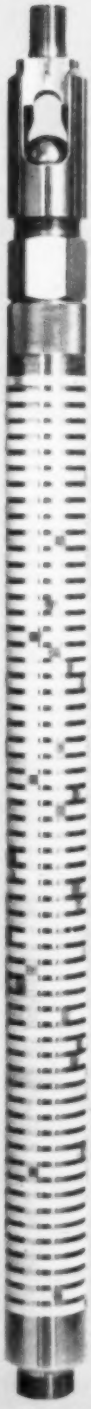
As fluid is forced through the perforations, a definite flow index is accurately established for different types of perforations and formations.

When you call Schlumberger, you can be sure that the perforator used on your well has been pre-tested under field conditions to give perforations with a maximum flow rate.

Schlumberger...to be <u>sure</u>!

Metal to Metal Wear...

is the real villain in sucker rod pump troubles. It accounts for most of your repair and pump pulling expense.



The Martin Idea...

for getting away from this trouble has always been to make use of the best available materials — *Natural Rubber* for the key material in plunger rings; *Synthetic Rubber* for the key material in resilient ball guides for cages.

The accurately grooved and drilled metal body of **The Martin Plunger** does not touch the barrel. Only the resilient rubber and duck rings contact the barrel. This material — with its great natural resistance to abrasion as well as its slipperyness-when-wet — has a much slower wearing action on the barrel. Most often your barrel will not need replacing. These rings have an amazing ability to take the kind of abuse that goes with oil well pumping, and this means longer runs. Plunger cost is reduced because replacing the rings costs only about one fourth as much as a new plunger, and this saving is, of course, added to the barrel saving and longer runs.

Patent No. 2,591,174

The Martin Rubber Guide Cage protects the ball from all metal contact except when it rests upon its seat. The ball is protected to such an extent that ball and seat life is usually doubled. The synthetic ball guide and stop cannot beat out because of its resilience. Its life is therefore much greater than any metal and you get this longer cage life in addition to better ball and seat life. The two guides are easily replaced when the occasion does arise.

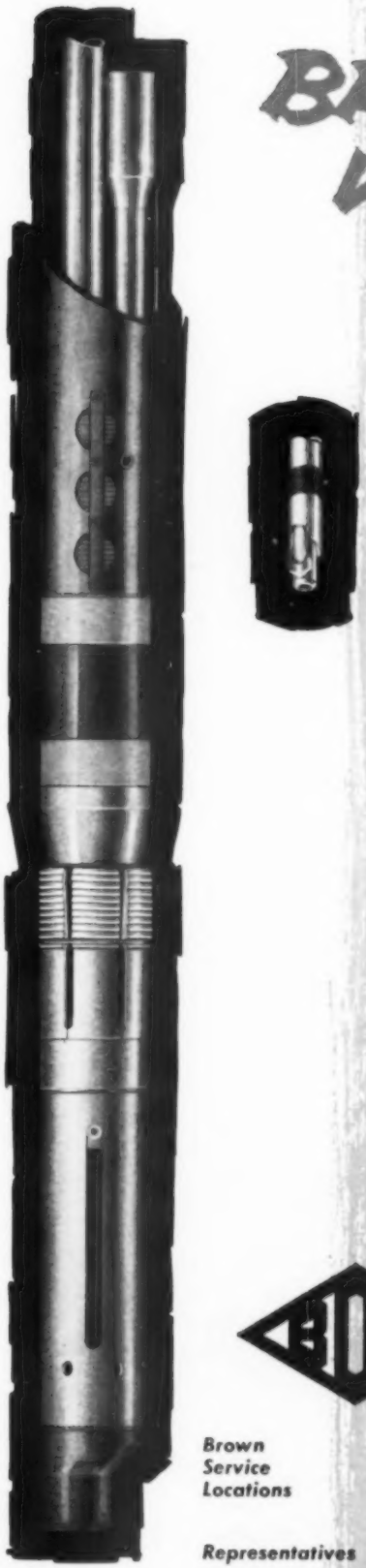
No real capital outlay is required to get these benefits because the cost of Martin Plungers and Martin Cages is very much the same as you are now spending for replacements — sometimes less.

All regular or stroke-thru ROD PUMPS and TUBING PUMPS can be equipped with Martin Plungers. Martin Rubber Guide Cages are made in all sizes and styles. Write for our catalog No. 4; also see Composite catalog for 1956-57.

JOHN N. MARTIN

Manufacturer

9 W. BRADY • TULSA, OKLA.



DS-3

BROWN was first!

BROWN OIL TOOLS pioneered in the design and manufacture of the first successful dual parallel, detachable string packer.

Others may copy, but experience counts most when you have a parallel string completion coming up.

BROWN OIL TOOLS now has several different types of parallel detachable string packers, tailor-made to meet any and all specific requirements for your well.

The DS-2 and DS-8 are field proved cup-type packers, which require no weight or surface manipulation to set. Only well pressure differentials are required to effect a leak-proof seal and firmly anchor the slips in either direction.

For wells where compression type seals and mechanically set slips may be preferred, **BROWN OIL TOOLS** has the DS-3 and DS-4 with lead seals added above and below the rubber seal for additional sealing surface and safety.

The DS-3 has a built-in hydraulic hold-down, for wells with very high pressures. This hold-down eliminates the need for heavy tubing loads to anchor the packer firmly.

The DS-4 (DS-3 without hold-down) has proved very successful in average pressure wells under such conditions as deep swab-downs and gas lift—without leaks or tubing kinks.

If you need help, call BROWN. BROWN has the over-all manufacturing experience and field know-how.

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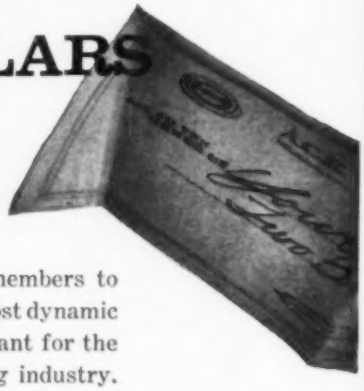

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. . . a capital investment of . . . $1,237,842,896

Capital funds invested in inventories: Manufacturing companies with their investments in raw materials, work in process, and finished products . . . supply companies with their stocked warehouses and their 1000 field stores each stocked with 10,000 to 12,000 different items . . . service companies' investments in expensive specialized equipment and many of them with big inventories of material for their specialized service . . .

. . . a capital investment of . . . $1,053,360,316

No other industry requires such a variety of specialized precision equipment and services. No other industry has such a variety of problems—extreme pressures . . . abrasive cutting . . . rugged terrain . . . extremes in temperature.

Free enterprise attracts men who have confidence in themselves—men who find their reward in solving the tough problems of the petroleum equipment-supply-service business.

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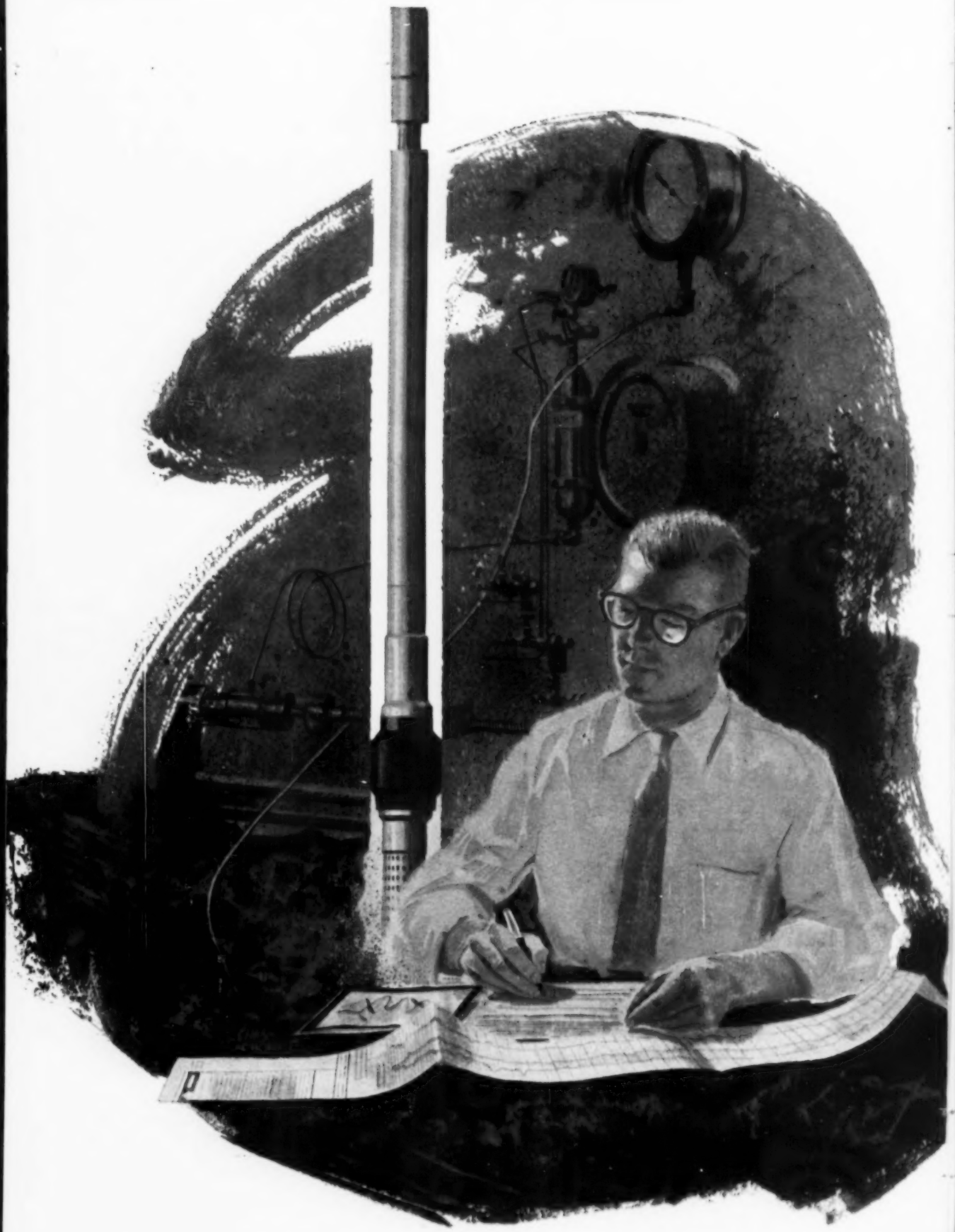
Composed of: ***manufacturers*** **whose plants make the finest precision equipment...** ***supply stores*** **who add two other ingredients of value — where you want it — when you want it...** ***service companies*** **who make available to their customers the practical results of the theoretical research of some of the most brilliant scientific and technical men in the world.**



Build-up, Draw-down

key to formation pay-off

. . . and Johnston Testers super-sensitive Tension Type Pressure Recorder is the key to accurate sub-surface pressures.

If it were possible to send your petroleum engineering lab to the bottom of the well, you couldn't get a truer indication of productivity index before permanent completion.

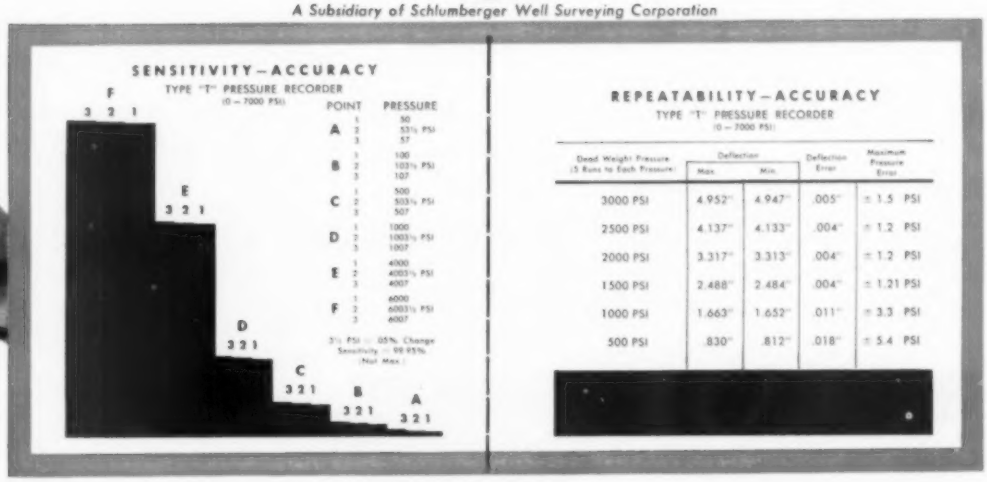
Why be satisfied with an *approximate* reservoir evaluation when Johnston Testers enable your engineers to see the true picture?

The Tension Type Pressure Recorder used in conjunction with Johnston Formation Testers is so sensitive that it faithfully records pressure changes of as little as 5/100 of 1 per cent! Yet it is as rugged as a tool joint.

JOHNSTON TESTERS

first in drill **stem testing**

A Subsidiary of Schlumberger Well Surveying Corporation



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Win Well 7-WAY MULTI-PORT ROTARY SELECTOR VALVE

7 WELLS (or less) CAN BE FLOODED FROM ONE CENTRAL SOURCE!

Low-cost water distribution to several wells at once . . . application of **specific volumes and pressures** to different wells . . . the ability to **determine the productivity** of any of the wells involved . . . these are the revolutionary advantages in applying the new Win-Well Multi-port Rotary Selector Valve to waterflooding systems. The simplicity of Win-Well's design, and the field-tested adaptability of the Win-Well Valve to other manifolding systems offers great advantages to multi-well operators. Detailed explanations of Win-Well's uses are yours upon request.

- **Simplifies METERING TESTING SAMPLING GATHERING MANIFOLDING TANK-SWITCHING**
- **Cuts Costs on expensive Multi-well systems**
- **No Corrosion Worries**
- **Teflon Bushings**
- **Meehanite Castings**

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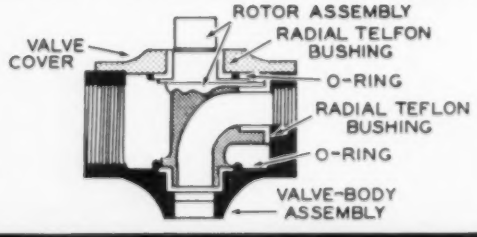

Win Well Manufacturing Company

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total of 26 ft of open hole in the Woodbine sand was left available for injection.

Well was then connected and the initial injection rate was 12 bbl per min at 30-in. vacuum at the wellhead.

Success Due Gelled Water

It is the belief held by fracturing engineers on the Hardwicke-Sunkel well that the gelled water spearhead was in part responsible for the success of the large fracturing operation. Based on attempts to frac wells in the Woodbine and similar formation using water without gel, in almost every case the wells would lock up with 10,000 lb of sand or less in the formation even though an injection rate as high as 33 bbl per min was obtained. On one well an injection rate of 42 bbl per min was obtained, locking up with 7500 lb of sand in the formation. This was an oil producing well. A second attempt at this particular well, experimenting with 5000 gal of gelled water and using similar equipment, was successful, putting 20,000 lb of sand into the formation without difficulty.

Engineers held that one of possibly two things happened by using the gelled water ahead of the frac. The gelled water acted as a water fluid loss agent by filling up the more porous sections allowing the fracturing fluid to be isolated to a more narrow section of the formation. This, in effect, controlling fracturing fluid to prevent leakage away from the sand or the gelled water may have fractured the location allowing the sand to be placed into the created fracture.

Considerable fracturing of the formation took place in the Hardwicke-Sunkel well, as noted by the sand and conglomerate bailed from the hole. Apparently, the fracturing job has proved itself profitable, since injection rate of 12 bbl per min, at 30-in. vacuum at the wellhead is being held.

Sunkel Well Sets Pattern

In the months following the Sunkel 1-A frac, the East Texas Salt Water Disposal Company has had other wells similarly treated. Other wells in the same area, belonging to other operators, have been similarly fractured using amounts of sand not common in the East Texas field for wells being used for salt water disposal.

Fracturing data and results of six of these wells are presented here.

Acknowledgment

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★ ★ ★

HOW TO PREVENT *Crude Oil Corrosion*

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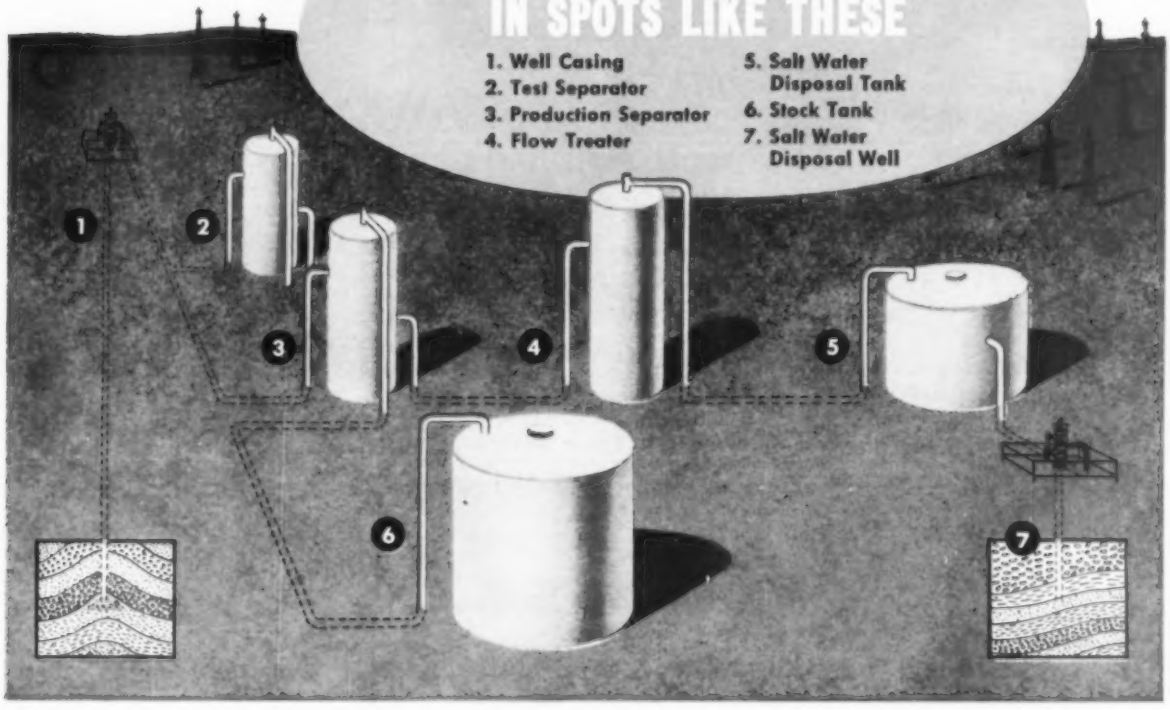

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If you have a corrosion problem—above ground or below—call on *Pittsburgh.* Without obligation, our engineers will gladly tackle your specific crude oil corrosion problem . . . and come up with dollar-saving answers. Let us hear from you today.

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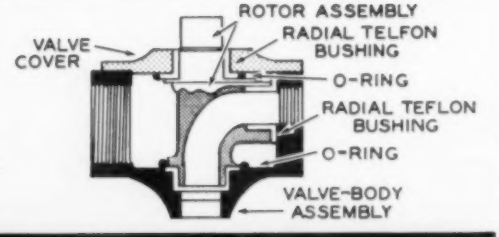

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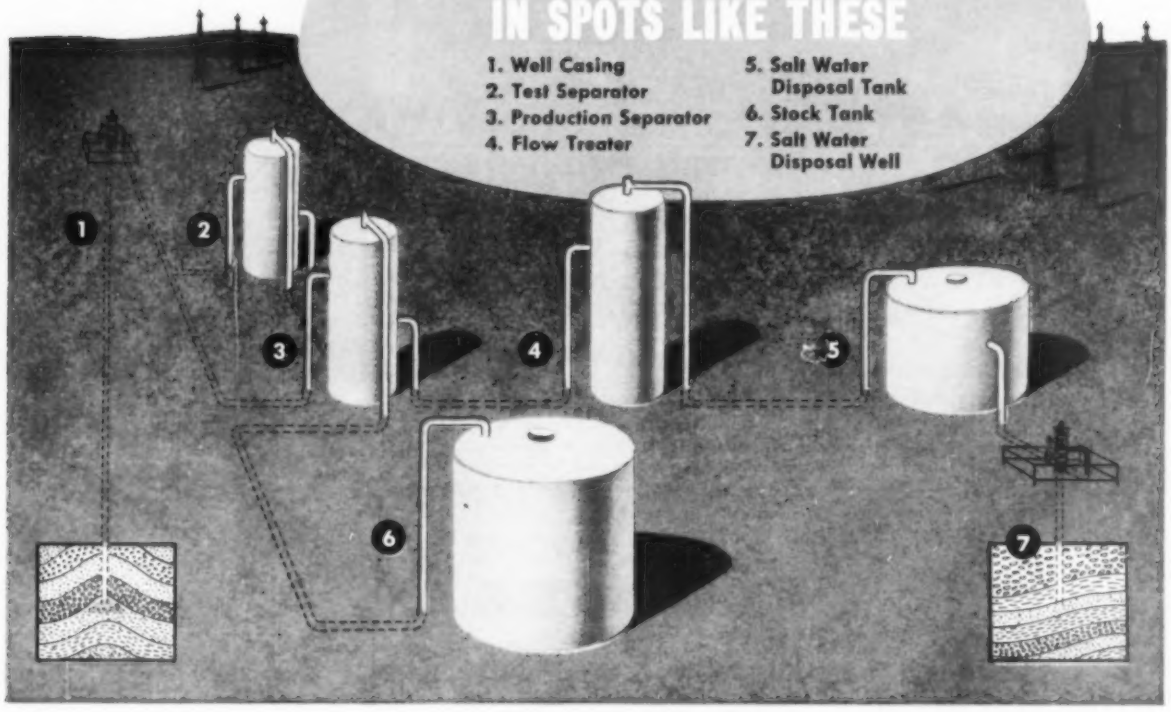

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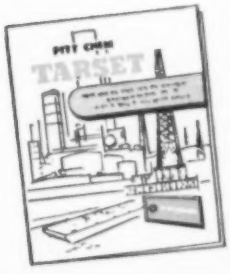

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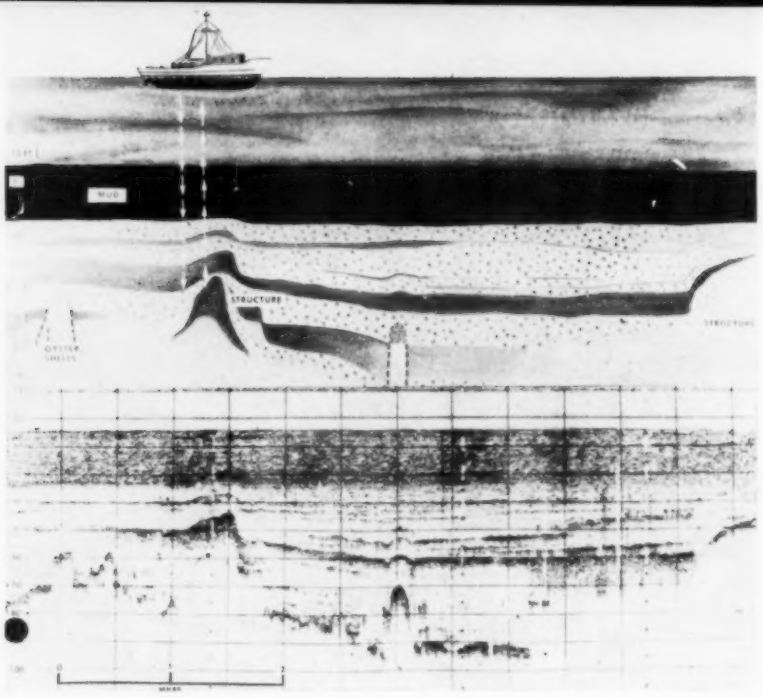


FIG. 1. **New tool,** mounted on sea-going vessels, is similar in construction and operation to conventional recording echo sounders used for measuring water depths, but using much lower frequency sound pulses and much greater power.

FIG. 2. **Receiving transducer,** mounted as an outrigger aboard the M/V Falcon. Transducer is swung down and fastened to the hull of the boat when a survey is being conducted.

P 306.15

SUB-SEA SEISMIC TOOL

Newly released data, profiles, illustrates value of Magnolia Petroleum's marine seismic system

OFFSHORE geological, geophysical, and engineering surveys are being made easier because of a new system developed by research scientists of Magnolia Petroleum Company. The instrument, called the Marine Sonoprobe, has been found successful in exploring the ocean floor and sediments 80 ft or more beneath it.

The instrument is finding ready acceptance only in offshore oil exploration, in submarine pipeline construction, and underwater salvage operations.

Since announcement just a few months ago, the instrument has been licensed for use throughout the oil industry.

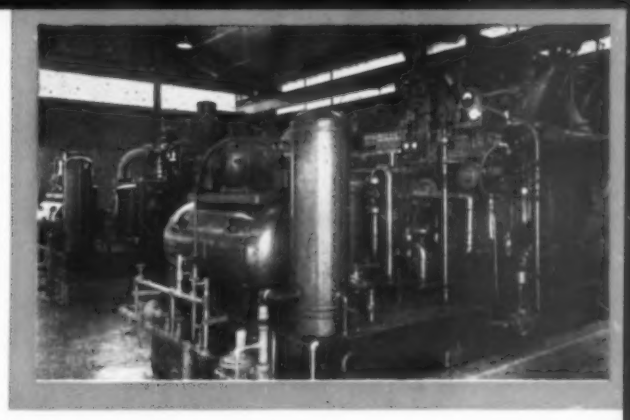
Magnolia and General Petroleum Corporation have been using it as a reconnaissance tool in offshore oil exploration. Magnolia has also used it for mapping the routes of underwater pipelines and in surveying sites for offshore drilling platforms, for which pilings must be driven into the sea bottom.

Mounted either on shallow-draft or larger vessels, the new tool has been used to find buried beds of oyster shells, which are then dredged from beneath the ocean floor for use in road construction and in making cement, chemicals, and fertilizer.

Experience with the Marine Sonoprobe indicates that it will provide reliable maps of shallow salt domes, shallow faults, buried ancient channels and valleys, and shallow geological structures. It may also give useful information to determine the extent of silting in reservoirs.

Development

Several years ago the Magnolia Petroleum Company field research laboratory began a study of the Recent sediments in the Gulf of Mexico. This study was undertaken for the purpose of gaining a better understanding of modern sediments and the processes which form them and thereby increasing our understanding of ancient sediments. Early in the study it became apparent that adequate stratigraphic information could not be acquired from bottom sediment samples alone. In order to obtain additional stratigraphic information and to do so at a more rapid rate than is possible by coring, plans to use an echo-sounder were outlined. Echo-sounders, however, are designed primarily for the purpose of determining the depth of water. In general, the acoustic energy put out by these echo-sounders does not penetrate very far into the sediment and, as a result, they have only limited value for stratigraphic investigations. The need for an instrument designed specifically for stratigraphic investigations of the sea floor led to the development of this new system.



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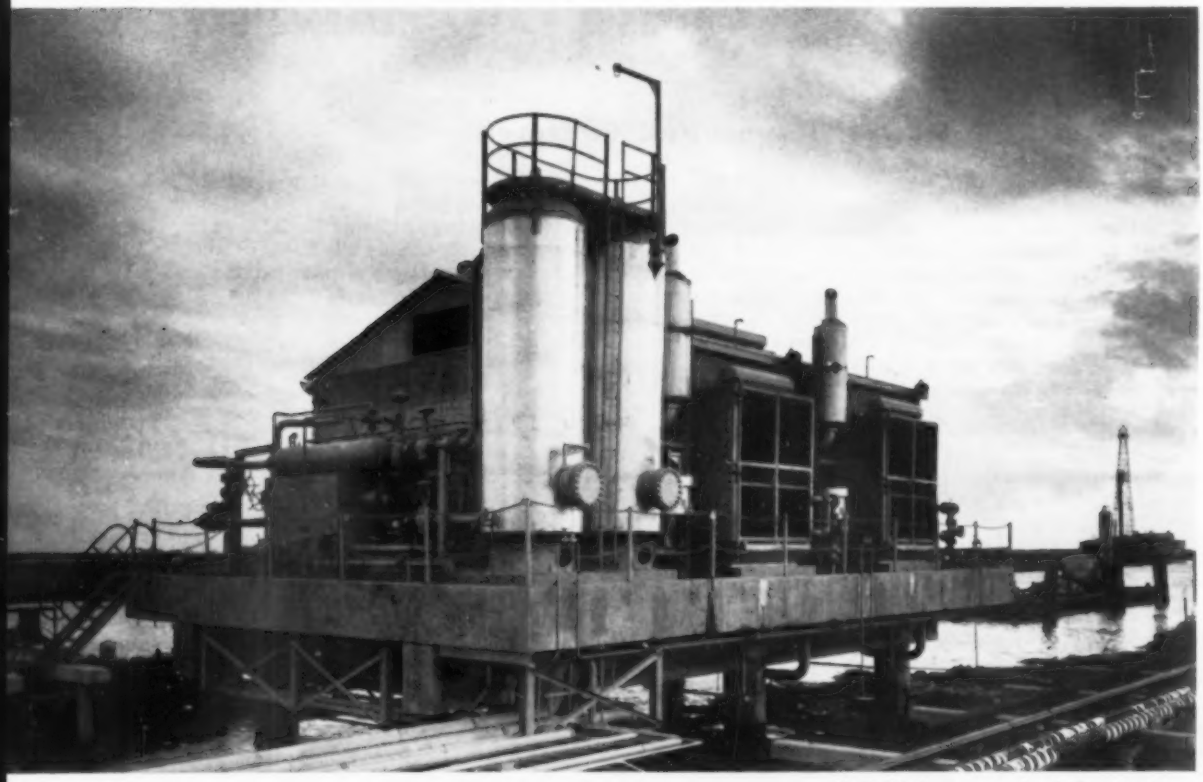
PERFECT BALANCE FOR VIBRATION-FREE OPERATION

The perfect balance of these two Cooper-Bessemer GMXD-8 compressors and their packaged components allows them to compress 19 million cubic feet per day from 350 to 900 psi—vibration-free. Southwest Packaged Gas Compressors can be installed in any location to do any compressing job. They can be mounted on piling, pre-stressed concrete platforms, barges or wherever necessary for most economical installation and operation.

The unattended operation, possible with the automatic controls and safety devices on Southwest Packaged Compressor Plants, cuts operating costs per horsepower-hour to a fraction of the cost of a fully attended stationary installation. A Southwest engineer can show you actual comparative operating costs. Available in sizes from 265 h.p. to 660 h.p.



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Dowell Developed Cealment

Cealment*—the first really new cementing service in 20 years—was developed and introduced by Dowell in 1955 to answer cementing problems plaguing oil operators everywhere.

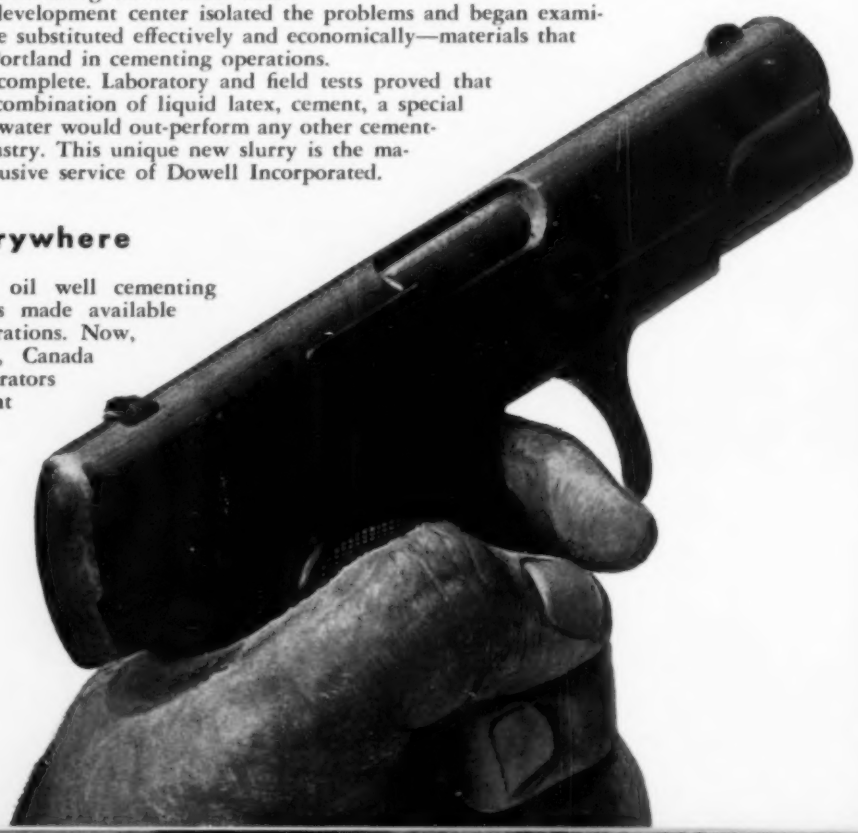
For years it had become increasingly apparent that common Portland cement could not always be depended upon to provide a satisfactory cement job. Regular cement was showing high fluid loss and a high shrinkage factor. As perforating became more practical, common Portland cementing became more impractical, shattering and breaking down under stress.

The Dowell research and development center isolated the problems and began examination of materials that could be substituted effectively and economically—materials that would give service superior to Portland in cementing operations.

By early 1955 the job was complete. Laboratory and field tests proved that a slurry containing the proper combination of liquid latex, cement, a special Dowell surface-active agent and water would out-perform any other cementing material offered the oil industry. This unique new slurry is the material used in Cealment, an exclusive service of Dowell Incorporated.

Available Everywhere

Cealment, Dowell's specialized oil well cementing service using latex-cement, was made available in 1955 to all areas of oil operations. Now, throughout the United States, Canada and Venezuela—wherever oil operators want it Dowell provides Cealment service. Trained crews with hundreds of jobs and a proved product behind them are available from any of the nearby 165 Dowell offices and stations. Call Dowell and ask for Cealment on your next cement job.



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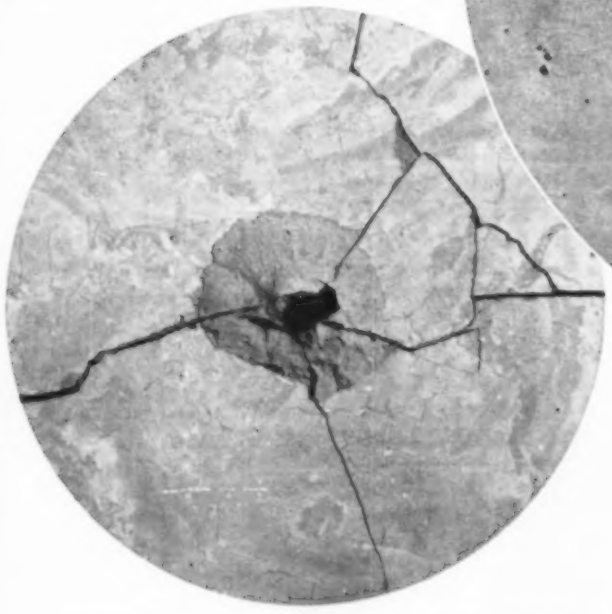

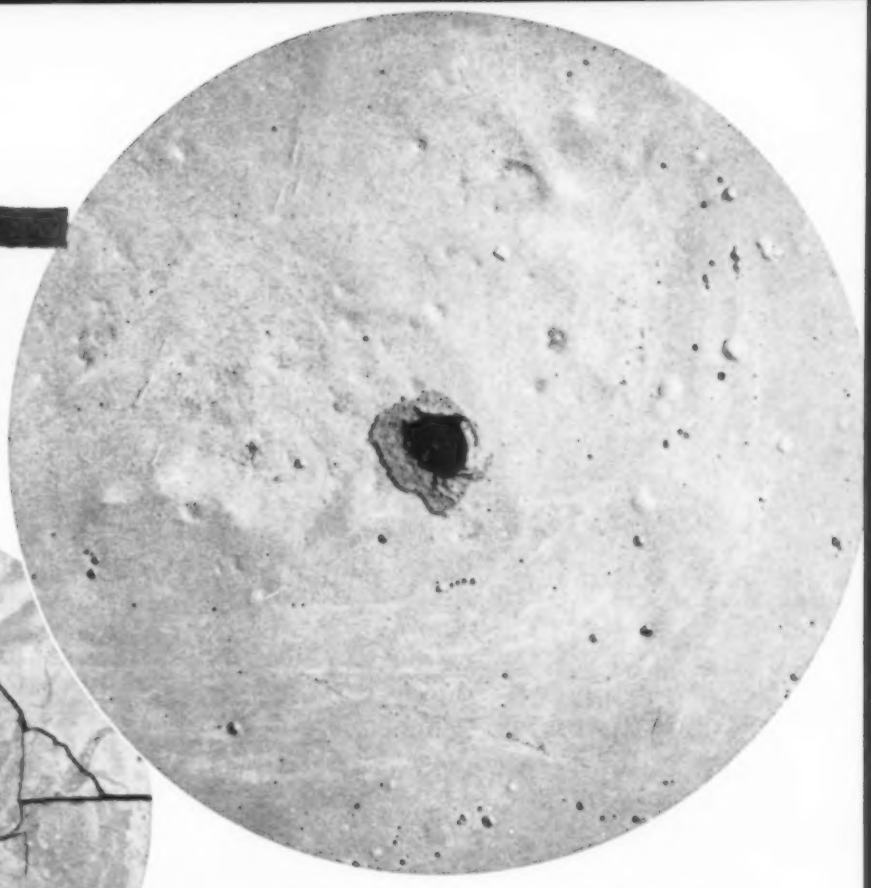

These samples were shot with a 38-caliber automatic. The latex-cement disk above was pierced without shattering. The disk at left is common Portland cement after receiving the same treatment.

DEPENDABLE FOR TOUGH JOBS

Cealment has provided successful results in cementing jobs —even under the most difficult conditions. It can be used any place regular Portland is now being used. It has proved especially useful for setting liners, squeezing, setting long string, tailing-in on long string and repairing holes in casing. With Cealment you save money, because this Dowell service helps you avoid unnecessary squeeze jobs and costly return trips.

LOW SHRINKAGE—Latex-cement does not shrink when set under pressure.

SUPERIOR BONDING—Bonding strength between the formation and the casing—whether in oil or water—is superior with Cealment.

GREATER RESILIENCY—Resists shattering when perforated. Affords little danger of intrusion of water from below or gas from above.

LOW FLUID LOSS—Permits low water content. Practically eliminates danger of incomplete shut-off due to shrinkage and flash-setting due to dehydration.

PERMANENCY—Cealment has extra resistance to sulphate brines without sloughing—provides durability.

RESISTANCE TO CONTAMINATION—Cealment assures better resistance to any acid or other well fluids that may be introduced later into a perforated zone.

Consult your Dowell representative for specific recommendations; in Venezuela, contact United Oilwell Service. Or write Dowell Incoporated, Tulsa 1, Oklahoma.

*Service Mark of Dowell Incorporated

NEW in 1955 — PROVED Today! Check just a few of the results made possible with Cealment.

DEPTH	PROBLEM	RESULTS
1588'	To prevent water communication on primary cement job.	265 gallons Cealment. Perforated and fractured; made 30 BOD, no water.
1900'	To set liner and isolate water.	975 gallons Cealment. Liner held. Fractured successfully.
2300'	Squeeze hole in casing after three previous squeeze jobs.	500 gallons Cealment. Hole repaired.
6355'	To squeeze channel for water shut-off, for recompletion.	500 gallons Cealment. Channel repaired.
4059'	To regain lost circulation.	750 gallons Cealment. Drilled out Cealment. Regained circulation and continued drilling.
4660'	Tail-in behind primary cement job.	275 gallons Cealment. Producing zones successfully isolated.

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Now: DRILOIL, an oil base mud you can mix and use in any oil field. Easily mixed right at your rig; needs no special equipment. Five years' development and field testing prove its superiority. Positive protection to all formations from water damage. Available immediately through Baroid distributors.

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DRILOIL oil base mud is not damaged by salt, anhydrite or cement. Tolerates up to 60% or more salt or fresh water by volume.

EASY TO SPOT OR PUMP

No thickening at the oil-water interface when spotted in hole containing water base mud. Perforating guns and other wireline tools can be run easily.

PRICED COMPETITIVELY

Material costs are competitive. Mud costs are less when mixed at the rig with locally available oils.

MIX AT YOUR OWN RIG

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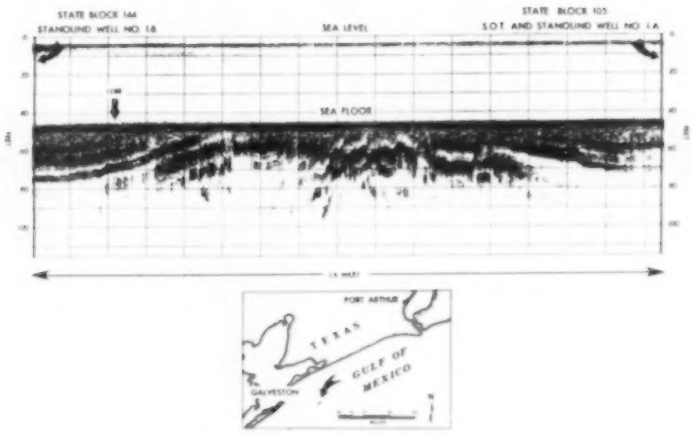


FIG. 3. **Profile** made by Magnolia's instrument of a truncated anticline in the Gulf of Mexico, near Galveston, Texas.

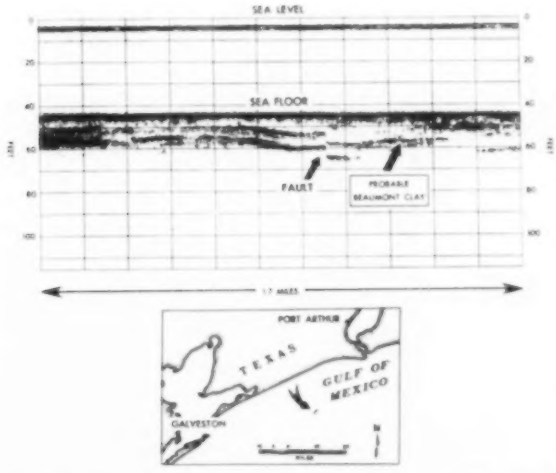


FIG. 4. **Normal fault** stands out in this profile taken in the Gulf of Mexico.

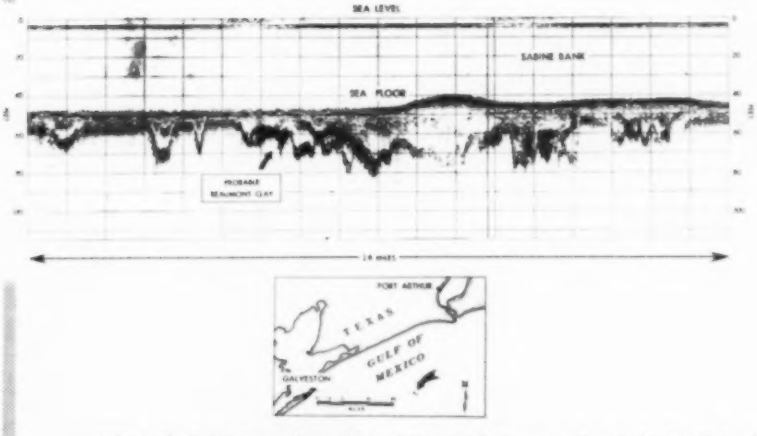


FIG. 5. **Ancient river channels** buried beneath Recent sediments in the Gulf of Mexico, as illustrated by this profile.

The Instrument

Basically, the system functions like a small reflecting seismograph. Sound pulses ("beeps") are generated at repetition rates of 3 to 12 per second; these pulses have a dominant frequency of about 3800 cycles per second, considerably lower than the 13,000 or more which echo-sounders use, but each pulse lasts less than one one-thousandth of a second. The sound waves are propogated through the water and into the sediments where part of the energy is reflected back by the interface between each pair of sedimentary beds that have the necessary contrast in acoustic impedance (Fig. 1). All of the factors which produce differences in acoustic impedance of sediments are not known at the present time, but lithological differences, or the character of the sediments, are known to have a pronounced effect on acoustic properties. The reflected sound waves are then picked up by the receiving transducer (shown in a retracted position in Fig. 2), converted into electrical signals, and recorded on continuously moving electrosensitive paper. The end result is a profile of the sea floor and the stratigraphic and structural relations of the beds of sediments immediately beneath the sea floor where differences in acoustic impedance have reflected acoustic energy back to the boat.

Examples of Geologic Phenomena

Surveys obtained with the new system off the coast of Texas have recorded many different geologic phenomena. Representative examples of these phenomena are discussed below.

Fig. 3 shows a truncated anticline located in the Gulf of Mexico near Galveston. There is no topographic relief on the sea floor above the anticline. Data obtained from coring at the point indicated shows that the Beaumont clay (Pleistocene) is overlain by 1.5 ft of Recent mud, thus proving that the reflections are related to features in the Beaumont clay. The dip of the beds on the flank of the structure is approximately one-half of a degree.

A fault with a vertical displacement of 5 ft is shown in Fig. 4. This fault is on the flank of a known structure.

Fig. 5 shows some ancient river channels now buried beneath Recent sediments. The topographic elevation is part of Sabine Bank in the Gulf of Mexico.

An excellent example of a facies change (change in character or texture) of the Recent sediments on Sabine Bank (Gulf of Mexico) is shown in Fig. 6. The clean sands are composed of 90 percent of material greater than 0.062 mm in diameter ("sand"

size) and 10 percent of material smaller than 0.062 mm in diameter ("silt" and "clay"). The clean sand is laterally equivalent to muddy sand which is composed of 50 percent of material greater than 0.062 mm in diameter and 50 percent of material smaller than 0.062 mm in diameter. The first reflection beneath the sea floor is the contact between clean sand and the underlying mud.

A profile obtained in Corpus Christi Bay, Texas, is shown in Fig. 7. The prominent buried mounds are oyster reefs or banks of oyster shells and sand beneath Recent sediments. Several reflecting horizons which correlate in some cases with changes in lithology are present. Stratigraphic pinchouts of sand and silt beds against the reefs are evident.

Resume

The results of surveys with the system have indicated that this instrument can provide valuable information about the sediments beneath a body of water. Because this system can do this at a fairly rapid rate, the instrument has many potential uses in the fields of geology, geophysics, and engineering. Information about the sediments that is necessary for the construction of offshore platforms and submarine pipelines can be obtained from these surveys. Extent of silting in reservoirs may also be determined. Geological and geophysical applications are obvious from the preceding discussion. The great potential which this instrument has exhibited can materially augment the information obtained from cores or other geologic data on the character of sediments. ★ ★ ★

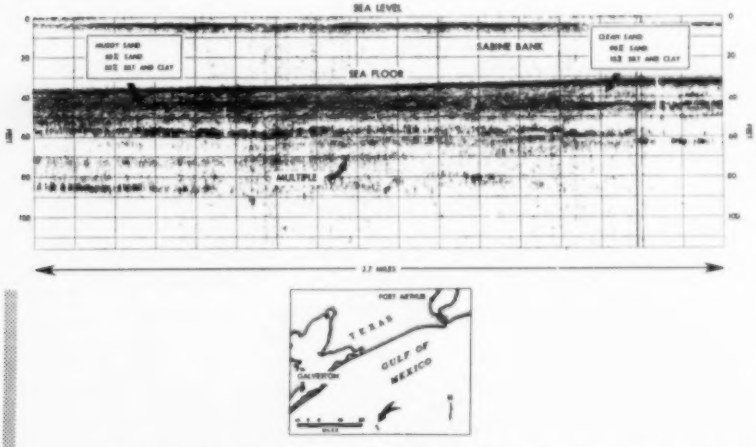


FIG. 6. **Sabine bank,** landward side, in the Gulf of Mexico, as recorded by the new instrument, showing the facies change of sand into mud.

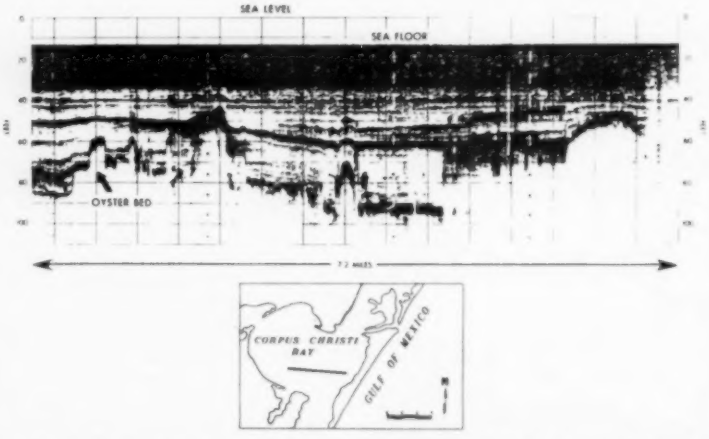


FIG. 7. **Oyster reefs** buried beneath Recent sediments in the Corpus Christi Bay, Texas, are shown in this seven-mile profile.

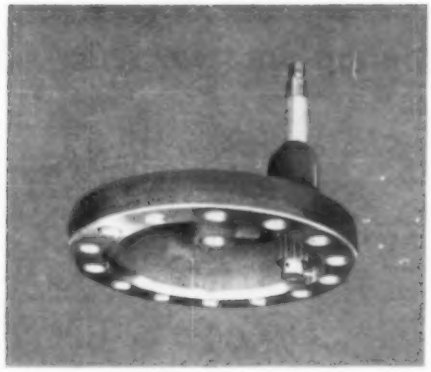
Geologists Complete Plans for St. Louis Meeting

Dr. Parke A. Dickey of Carter Research, Tulsa, Oklahoma, right, explains to Thomas E. Matson, center, Home-Stake Production, Tulsa, and L. Claude Roark, Buffalo Oil, left, Tulsa, some of the interesting features of Kiel Auditorium where the Technical program of American Association of Petroleum Geologists will be presented April 1-4. Dr. Dickey is chairman of the technical program. Matson is general vice chairman for finance and Roark is commercial exhibits chairman.

Also meeting with the AAPG will be Society of Economic Paleontologists and Mineralogists. Dr. Richard V. Hollingsworth, Midland, Texas, newly elected president of SEPM is chairman of the technical program for this group. Dr. Daniel A. Busch, Tulsa, is vice chairman of SEPM and a member of the central committee that is planning the annual convention.

It is expected that more than 2500 oil finders will attend the meeting where more than 75 scientists will present technical papers.

Theme of the AAPG meeting is "New Methods and Principles in Petroleum Geology." Since the war there has been tremendous emphasis on research in all fields of science, including geology. Within the past 10 years nearly all the major oil companies have established geological research groups; in addition they have subsidized research at universities through the American Petroleum Institute and by grants and fellowships. The results are just beginning to be known and their effect on geological thinking is revolutionary. At this meeting results from the research laboratories of nearly every major company will be presented.



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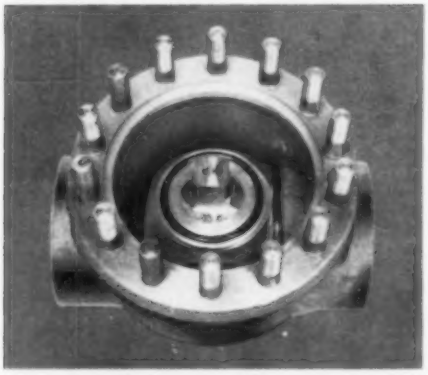

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THE OASIS — *A gathering spot for NOMADS*

"The Great American Brain Robbery" skit was put on at the December 12, 1956, meeting of the Los Angeles chapter of Nomads. Standing is Lee Laird (Francois Sleeperberger) of Laird Equipment & Sales Company, who is negotiating a deal with John Flanagan (Jacque Tester) of Johnston Testers (not shown). To Lee's right is Andy Anderson (Buggy Warner) of Pacific Perforating Company and to his left is Earl Boggess (Fancy Dresser) of Baker Oil Tools and Ox Morgan (Happy Mac) of Falcon Products. Other actors in the satire were: Joe Bergeron (Young Berg) of Jet-Lube, Ray Faulk (Victuals MacHinery) of H. C. Smith Oil Tools, Lew Bronzan (Bashful Ross) of Baash-Ross Tool Company, Jack Smith (Lord Byron) of Byron Jackson Tools, Murray Walker (Dusty Road Wells) of Lane Wells Company, Monk Cook (Chick Sands) of Chiksan Company, Ernie Fowks (Foxy Ernie) of Continental-Emsco Company and Pop Atkins (Papa DeVex) of Devex Engineering Company.

Nomads Meeting Dates and Secretaries

New York Chapter, first Monday, of the month, Hotel Roosevelt, New York. Executive Secretary, E. W. Hoeppner, in care of Hughes Tool Co., Room 4414, 30 Rockefeller Plaza, New York 20, N. Y.

Houston Chapter, second Monday. Ye Old College Inn, Houston, Texas. Executive Secretary, Harry E. Estes, P. O. Box 18161, Houston 23, Texas.

Los Angeles Chapter, second Wednesday, Jonathan Club, Los Angeles, California. Executive Secretary, W. A. Sawdon, P. O. Box 848, Hollywood 28, Calif.

Tulsa Chapter, third Friday, Mayo Hotel. Executive Secretary, E. L. Thomas, P. O. Box 4033, Tulsa, Okla.

Dallas-Fort Worth Chapter, first or second Monday. Secretary, R. B. Gilmore, DeGolyer & MacNaughton, 5625 Daniels, Dallas, Texas.

More Nomads activity on page B-145-146.

Newly elected Los Angeles officers for 1957 and the outgoing officers they replace shown at the annual business meeting of the chapter, January 9. Left to right (standing) John S. Page, Page Oil Tools, assistant treasurer 1956, Andy Anderson, Pacific Perforating Company, assistant secretary 1957; W. B. Reinhold, Abegg & Reinhold Company, assistant treasurer 1957; H. Rex Collins, Jr., Hydril Company, treasurer 1956; John McEwen, A. D. Rushing, Inc., assistant secretary 1956; Joe Schlarb, Continental-Emsco Company, regent 1956 and 1957; John Flanagan, Johnston Testers, senior regent 1956; J. Murray Walker, Lane Wells Company, deputy sergeant at arms 1956; (seated) Tom R. Ashe, Globe Oil Tools Company, deputy sergeant at arms 1957; Earl M. Daniels, Hydril Company, sergeant at arms 1957; Ben A. Hilliard, Web Wilson Oil Tools, treasurer 1957; Bob Gaylord, Wagner-Moorehouse, president 1957 and secretary 1956; Bill Brooks, Byron Jackson Tools, Inc., vice president 1957 and sergeant at arms 1956; Tom G. Martin, R. J. Eiche & Associates, secretary 1957 and vice president 1956; Harry E. Hester, McCullough Tool Company, regent 1957 and president 1956.

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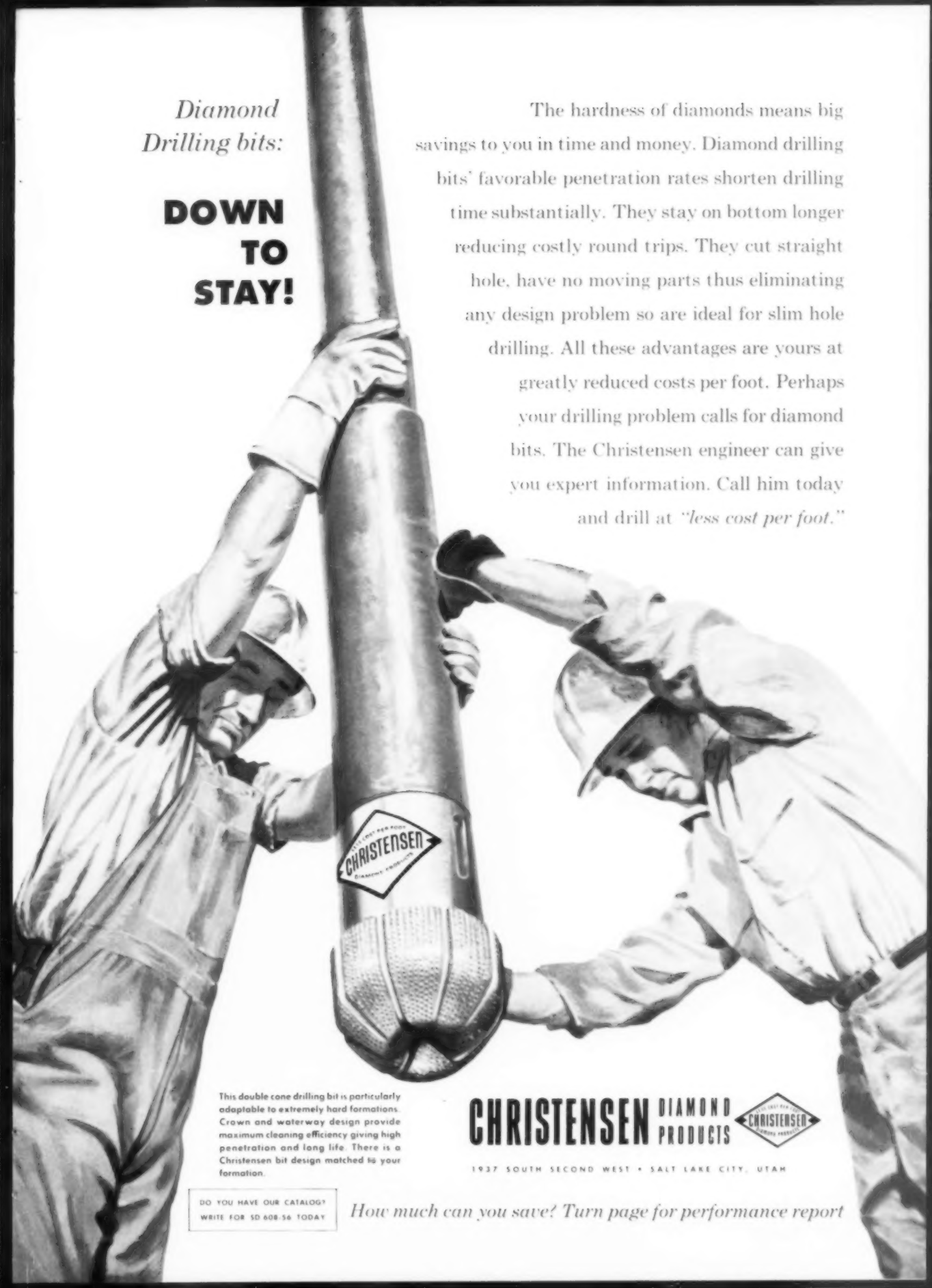

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President's gavel goes to Tracy Word, Jr., third from left, sales manager of Thornhill-Craver Company, who will lead the Houston chapter of Nomads this coming year. Making the presentation is W. O. Hedrick of the McEvoy Company, outgoing president. At left is Harry Estes, Oil Well Survey Instrument Company, executive secretary, and at far right is Ed Louden, Baroid, vice president.

Tulsa chapter of Nomads had a capacity crowd to hear Jefferson Woolf Mitchell, general manager, Daura Refinery, Government Oil Refining Administration, Baghdad, Iraq, at the December 4 noon meeting in the Mayo Hotel. Shown here are Guy Williams, 1957 president of the Tulsa chapter, Mitchell, and Don Collins, out-going president of the Tulsa chapter.

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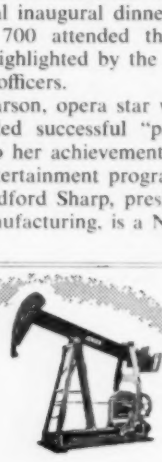
700 Attend Houston's 17th Dinner-Dance

One of the largest Houston area oil industry social events of the year took place January 26 in the Shamrock-Hilton when the Nomads held its seventeenth annual inaugural dinner-dance. More than 700 attended the affair which was highlighted by the installation of new officers.

Juliana Larson, opera star who has recently added successful "pop" engagements to her achievements, headlined the entertainment program. Her husband, Bedford Sharp, president of Mission Manufacturing, is a Nomad.

Tulsa's inaugural ball on January 25 was the setting for the installation of these officers. On the back row are pictured Don Collins of Republic Supply, senior regent; Guy Williams of Dowell, president; Bo Cummings, Axelson Manufacturing, sergeant at arms; Tom Lumly of Refinery Engineers, assistant secretary, and Bill Timberlake of Lucey Products, treasurer. On the front row are Oscar Irizarry of Petroleo Interamericano, junior regent; Bill Davidson of W. C. Norris Manufacturing, master of ceremonies for the ball; Harry Horton of Tretolite, assistant treasurer; John Pierce of Superior Iron Works, vice president; Vern Bailey, Bethlehem Supply, deputy sergeant at arms, and Paul McGivern of Baker Oil Tool, secretary.



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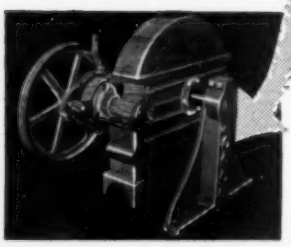

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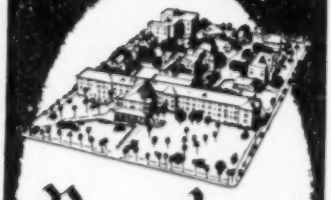

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FLORIDA

Chapters Complete Elections, Plan 1957 Activities

Officers of all Nomads chapters have been elected and installed, and plans are underway for various activities in 1957.

Los Angeles chapter has set dates for several of this year's coming events. Its annual Whing Ding is scheduled July 12, and the chapter's fall party has been set for October 11. Both events will be at the Lakewood Country Club in Los Angeles.

New York Chapter has tentatively planned its spring golf party at the White Beeches Golf and Country Club in Haworth, New Jersey.

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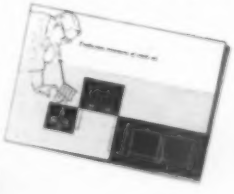

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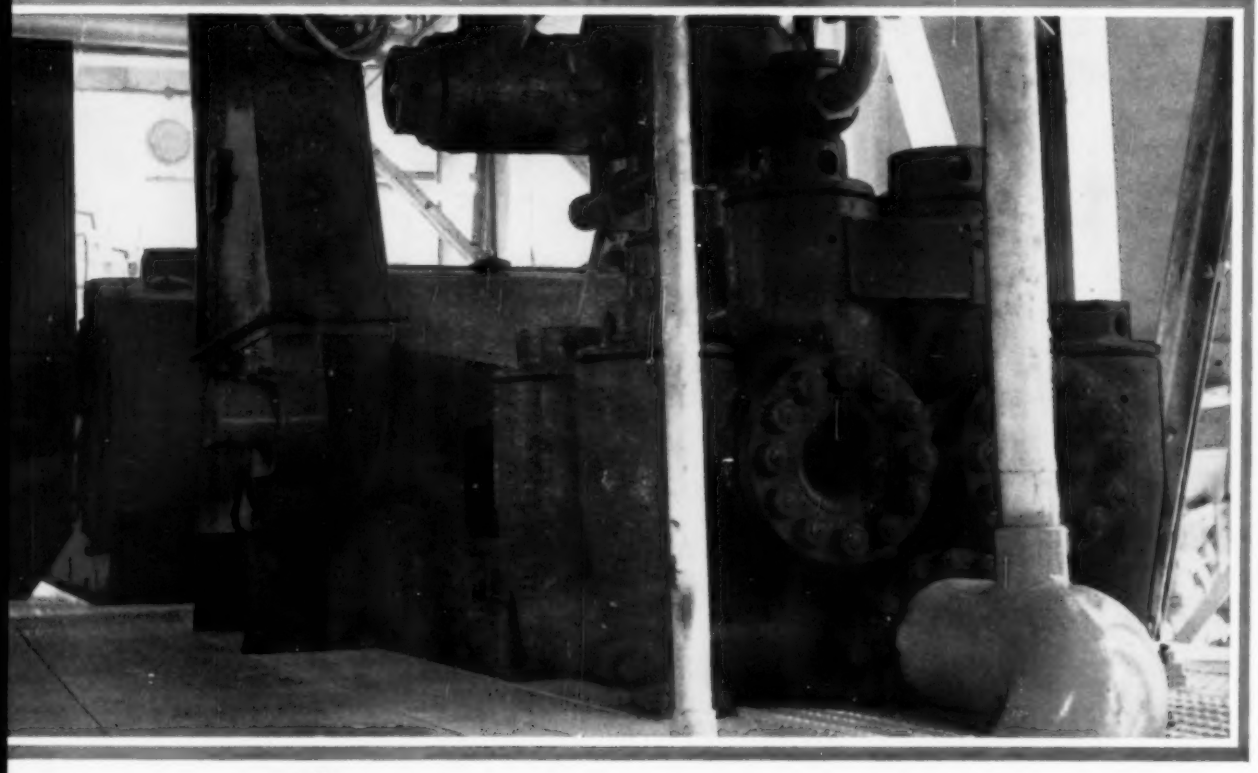

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EXPLORATION ACTIVITIES

CANADA

★ Phillips Petroleum Company has a significant Mississippian gas discovery on its Kobes Creek Prospect, 60 miles northwest of Ft. St. John, British Columbia. The discovery, No. 1 Townsend "A," has gaged 10,900,000 cu ft of gas daily on drillstem tests through small chokes from a portion of the top 51 ft of the Mississippian formation encountered at approximately 7100 ft. The new discovery is 7½ miles northwest of and on the same structural trend and structurally flat with the company's full interest No. 1 Kobes, multipay gas discovery, that tested an aggregate of 70,000,000 cu ft of gas per day when completed last year from the Mississippian and Triassic formations. Phillips owns approximately 45,000 net acres of permits out of 60,000 gross acres of permits on this prospect. Phillips is presently drilling a well between the No. 1 Kobes and No. 1 Townsend "A" wells which has not reached the Mississippian formation. Showings of gas have been encountered in the shallower formations. The No. 1 Townsend "A" also encountered gas in a number of shallow formations which will be tested. Ft. St. John Petroleums Limited owns a one-half interest in this well and 15,000 net acres surrounding it.

ILLINOIS

★ A new pay has been added to the old shallow Fairmont pool in Marion County. National Associated Petroleum Company of Tulsa, Oklahoma, has tested its No. 1 Ververs in the Trenton lime, with a yield of 1200 ft of gas, 90 ft of clean oil and 53 ft of oil and gas-cut mud and 10 ft of salt water, from a drillstem test at a depth of 3953-83 ft. Total depth of the wildcat is 4050 ft. Fairmont pool oil production is from the Benoist at 1400-50 ft.

★ Cities Service has released for drilling its Western Coal & Mining No. 1 McClosky test in Williamson County. The test is on the company's 10,000-acre Hurst block and is approximately 12 miles west of the West Frankfort Aux Vases field and 11 miles south of the North City Aux Vases pool. It is spotted slightly more than 30 miles southwest of Mt. Vernon.

NORTH DAKOTA

★ A 14,000 ft geological wildcat has been scheduled by Amerada Petroleum Corporation in an attempt to find oil in the Silurian or a deeper pay zone. Well has been staked the No. 9 North Dakota State, lying in the Beaver Lodge pool of Williams County, which produces from the Madison lime between 8300 and 8500 ft. Worley and Harrell, Inc., Tulsa, Oklahoma, will drill the deep test, using same rig that drilled the 13,615 ft No. 1 Iverson-Nelson, three miles to the southwest. The Iverson-Nelson well is now being completed in the Silurian at a plug-back depth of 13,525 ft. On test, this formation yielded 4,000,000 cu ft of gas. Different zones had oil shows, operators report.

PENNSYLVANIA

★ Manufacturers Light and Power Company has opened a new gas pool in Indiana County, in the southwestern part of the state. Pool opener is the No. 2 R. and P. Coal Company in the Young township. Initial flow from the well was gaged at 1,812,000 cu ft of gas per day from the Oriskany formation at 7618 ft. Total depth of the wildcat was 7718 ft.

★ A second gas discovery was made in Indiana County by New York State Corporation's No. N-514 Bodine. This well, in Young township, made 348,-000 cu ft of gas per day from the Oriskany at 7491-519 ft. The discovery was bottomed at 7505 ft.

UTAH

★ In San Juan County, J. E. Burke Jr. and New Drilling Company are still drilling at their No. 1 Navajo-Southern Union, which already appears to be an oil discovery. On two-hour drillstem test, gas was surfaced in 40 minutes and recovering 230 ft of free oil, 180 ft of oil cut mud and 90 ft of muddy water. Test was made at a depth of 6553-610 ft in an unnamed formation. Initial flow pressure was 195 psi and final flow pressure was 565 psi. The 30-minute shutin pressure was 1845 psi. Well, a farmout from Southern Union Gas to Carter Oil Company to Burke, is planned as a 7200 ft Mississippian test in the Lower Paradox Basin. Crew was last reported drilling below 6753 ft.

★ Paradox production has been found in Shell Oil Company's No. 22-12 North Desert Creek, a half-mile field extension in San Juan County. Well flowed at the rate of 1400 bbl of oil per day with 500,000 cu ft of gas from a depth of 5409-98 ft. Well has already tested pay opposite the Upper Hermosa.

TEXAS

★ F. C. Gaines Jr. No. 1 Edward L. Livingston has been filed as an Austin Chalk oil discovery in Bexar County. Well, drilled on a 53-acre lease two miles northwest of Losoya, flowed on initial potential test 403 bbl of 17 deg oil plus 4 bbl of water per day. The discovery was gaged from open hole at 1855-86 ft through 20-64-in. choke.

★ In Goliad County, three miles northeast of Goliad, Nortex Oil & Gas Corporation has completed a new dry gas discovery. Well is the No. 1 J. B. Wilhelm, which flowed 38,000,000 cu ft of gas daily (open flow) from perforations at 3062-70 ft. Shutin pressure was 1303 psi.

★ New wildcat has been staked by The Texas Company on the old Keechi salt dome about 6½ miles northwest of Palestine in Anderson. The new test, scheduled to go to 5700 ft, is the No. 1 S. W. O'Flynn. The area has seen spasmodic drilling attempts dating back to 1916. If carried to full depth, the well would be 2000 ft deeper than earlier tests. Keechi dome is 15 miles southeast of the Bethel salt dome where The Texas Company opened Woodbine production at the Bethel field late in 1956.

★ A new Wharton County wildcat has been staked by Associated Oil and Gas Company, about ½ mile south and east of nearest production in the Trans-Tex field. Production is being sought in the Miocene and Catahoula at 2800-3100 ft, according to the operators, but a 5200 ft drilling permit has been requested for a possible test of the Frio if such is indicated. Location of Associated's No. 1 P. J. Merta et al is 660 ft from the west line and 330 ft from the north line of the 196.4-acre Merta tract, in section 38 of the J. A. Jamilton Survey A-589.

★ Cities Service is locating a Swastika test on the jointly-owned Swenson Flat Top Ranch of Stonewall County. Test is Flat Top 113 No. 1, located approximately 17 miles southeast of Aspermont, and three miles north of the East Hamlin Swastika pool. The 3200-ft test is spotted in the center SE SE SW Sec. 113, BBB&C survey. Cities Service has a 50 percent interest in the 18,470-acre ranch and will operate.

KANSAS

★ A Mississippian gas discovery has been made by Honaker-Davis Drilling Company's No. 1 Kane, 4 miles south of the Nichols field in Kiowa County. On drillstem test at 5000-15 ft, well flowed gas at the rate of 1,450,000 cu ft daily. Bottomhole pressure was 780 psi. Mississippian was topped at 4987 feet.

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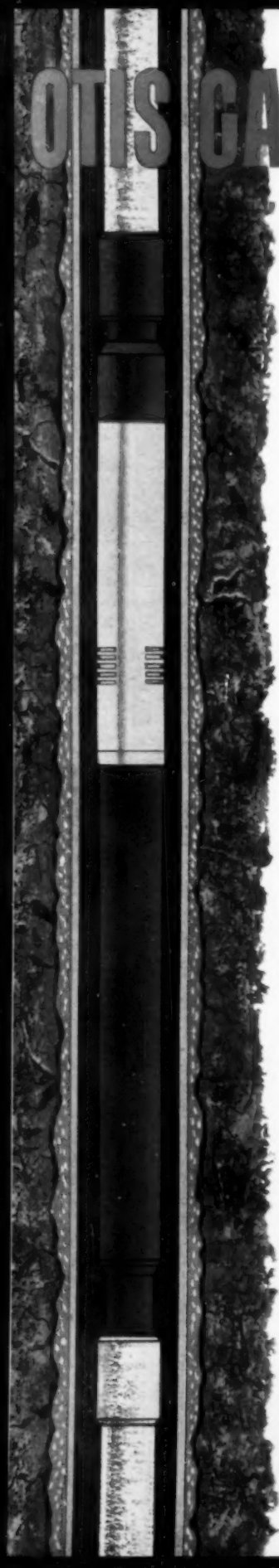

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Exploration

OKLAHOMA

★ Toronto gas production has been added to the Guymon-Hugoton field by Panhandle Eastern Pipeline Company at its geological wildcat in Texas County. Company's No. 1 Wilson, which had indicated commercial oil production in the Morrow sand during drilling phase, was tested in the Toronto perforated at 4248-60 ft. Gas from this formation flowed at the rate of 12,000,000 cu ft per day. Ater acidizing, flow increased to 35,525,000 cu ft daily. Well is being completed dually in the Toronto and Morrow. Morrow oil flow was 17 bbl in 7 minutes on test from a depth of 6441-72 ft. The Marmaton, which had also suggested production, has been abandoned.

★ Anderson-Prichard Oil Corporation has established a third oil productive zone at its No. 1 Buckheit Unit, a confirmation test well to a new pool southwest of the Northeast Noble field in Cleveland County. New production is from the McLish, which yielded 7000 ft of free oil in a 94-minute drill-stem test at 8334-74 ft. Gas surfaced in 11 minutes on the test. Well was to be drilled to 8420 ft before running casing. Well was logged to 8411 ft. Anderson-Pritchard's well also confirmed production in the Bromide and Tulip Creek sands, found in the discovery well.

NEW MEXICO

★ Magnolia Petroleum Company has completed a Mesa Verde formation discovery in Rio Arriba County, in the northwestern part of the state. New find is the No. 1 Cheney-Federal, located 2 miles east of the Dogie Canyon pool. Well tested an initial flow of 6,700,000 cu ft of gas per day through perforations at 5497-6000 ft. Total depth of the well was 6150 ft.

LOUISIANA

★ A high pressure well has been completed by Union Oil and Gas Corporation of Louisiana on the southwest side of the Lake Arthur (South) field in Jefferson Davis Parish. Well is the No. 2 Elue Roach, drilled to a total depth of 15,461 ft, with productive pay at 15,130-308 ft, proving a new pay zone. Tubing pressure on the well went to 11,600 psi when the well was closed in to remove drilling rig from the well site. Well was completed flowing 190 bbl of condensate and 6,375,000 cu ft of gas per day through 1¼-in. tubing with a pressure of 10,300 psi. Mud weight of 18 lb per gal had been required to drill the sand. Well was equipped with Christmas tree tested to 30,000 psi and using special high tensile strength deep well casing and tubing. Lake Arthur field has 24 wells completed in the high pressure zones, all drilled since 1953.

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What's doing in DRILLING

★ **Spree in the Texas Panhandle** is underway. New filings to drill have junked all previous records — even those set back in the Panhandle boom days of 1926-1936. Texas Railroad Commission recorded 57 intentions to drill during the second week of February, more than any number started in any 7-day period. Breakdown of the activity shows that natural gas is the main objective; three wildcats were slated — two in the Anadarko Basin sector and one in the main Amarillo Fold region. El Paso Natural Gas Company staked 15 of the new tests, 12 in Collingsworth and 3 in Gray County.

★ **California tidelands** drilling can't get underway until December — at the earliest, says F. J. Hortig, state lands commission mineral resources engineer. All offshore leasing on state-owned lands has been suspended until the legislature can agree on royalty formulas. If present rules are amended, such changes cannot be made until 90 days after the state legislature adjourns. If, on the otherhand, no amendments are made, the state lands commission would need several months to process offshore parcels before offering them for lease bids. The tie-up does not restrict core hole drilling and seismic work now in progress.

★ **Continued drilling on tidelands** of Redondo Beach, California, has been assured by city council approval of a request by Signal Oil and Gas Company. Company received permission to drill additional wells from a location directly oceanward from existing producing wells. Signal's new location is presently designed for 24 wells, although more wells may be drilled from the same site.

★ **Sea Drilling Corporation** has been organized in New Orleans, Louisiana, for the purpose of Gulf offshore drilling. Corporation is a joint venture of American Marine Corporation of New Orleans, D. D. Harrington of Amarillo, Texas, and Carl M. Loeb, Rhodes & Company, New York. Loeb is arranging for $6,000,000 in financing to equip the firm. S. F. Rowan, former vice president of American Tidelands, Inc., is president of Sea.

★ **Offshore drilling in Ohio** may be in the offing. State Geological Survey has been authorized to survey and advertise for leasing two 5000 acre blocks of land in the Cleveland area. The acreage lies in Lake Erie in the north-central part of the state. Five-year leases are to be offered for highest bonus bids, with yearly rentals of 50 cents. The Pennsylvania legislature is reported to be considering the leasing of offshore tracts along the shores of Lake Erie that lie in that state.

★ **Michigan offshore hearing** was held in February by the Oil and Gas Association to discuss aspects of drilling and development of oil and gas in waters of the Great Lakes. Geological survey division of the Department of Conservation will use the opinions expressed as a guide to regulation of exploration and development in Michigan waters. Panhandle Eastern Pipe Line Company is now drilling a test near Boyd, with doghouse talk suggesting that development in that area could develop out into Lake St. Clair between Michigan and Canada.

★ **Michigan drilling** is definitely lagging this year. Activity got off to a slow start in January with only 16 drilling permits being issued, as compared with 36 in January, 1956. Bad weather is getting most of the blame for rig stacking in that state, although operators have shown little desire to drill. During the first week of February only three new intentions to drill were filed with the State Department of Conservation. One of these new starts was to be a wildcat, the other two, for gas.

★ **Oklahoma drilling during 1956** was done by more than just a few. According to a recent survey, Phillips Petroleum Company, who drilled more than any other, drilled 249 wells last year. This amounts to little more than three percent of the 8000 wells drilled in that state last year. The survey indicated that 25 companies and individuals most active in Sooner drilling accounted for only 2162 of the wells. Analysis of these same operators indicates that independents drilled as many or more as the major companies. Among top 11 operators were: The Texas Company, drilling 172; Sunray Mid-Continent, 150; Magnolia, 145; Sinclair, 136; Forrest H. Lindsay, 128; Continental Oil, 97; Shamrock, 96; Kewanee, 83; Pan American Petroleum, 82, and Christie and Stewart Drilling, 80.

★ **Western drillers** hit a high success ratio in the first month of the new year, according to Petroleum Information. Of the nine states reporting, more than 50 percent of the 319 wells drilled were successfully completed — 111 oilers and 52 gas wells.

★ **Canamerican Drilling Ltd.** has taken over and will operate all drilling equipment formerly owned and operated by Rio Palmer Oils Ltd. All drilling personnel formerly associated with Rio Palmer are now associated with the new company, located in Calgary, Alberta.

★ **South Pacific Company, Ltd.,** an Australian corporation, has been formed to conduct drilling operations in the Mantuan Downs concession in east central Australia. Company has rights on some 7000 square miles in state of Queensland, some 450 air miles from Brisbane. Drilling operations, based on recent geological explorations, are expected to go to 8000 ft. Directing these operations will be Joseph L. Hargrove, who will headquarter in Australia. He is vice president of the new company and a partner in Hargrove Oil and Gas Company. President of South Pacific is R. R. Herring, president of Fish Service Corporation, Houston.

★ **Blue Water Drilling Corporation** has been established in New Orleans to perform contract drilling in offshore areas along the Gulf Coast. Organization is owned by Olin Oil and Gas Corporation, Mississippi River Fuel Corporation, Austral Oil Exploration Company, Inc., and Crescent Drilling Company, Inc. Keel was laid in February for the company's first drilling barge, to be built along the lines of Kerr-McGee's Rig 46. It is to be ready to drill by August 1.

★ **Barnwell Offshore, Inc.,** Shreveport, Louisiana, formed in December, 1956, will use proceeds of new issues to build new drilling equipment for its proposed offshore operations in the Gulf. A mobile drilling platform has been proposed for construction. Barnwell put $2,000,000 of six percent subordinated sinking fund debentures, due in 10 years, and 600,000 shares of 50-cent par common stock into registration with the Securities and Exchange Commission.

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Drilling

★ **McGoldrick & Watson Drilling Company** has been formed in Shreveport, Louisiana, for contract drilling in the northern Louisiana and southern Arkansas areas. Owners are E. W. McGoldrick, Kenneth M. McGoldrick and J. M. Watson.

★ **Offshore barge christening** of Ocean Drilling and Exploration Company's newest vessel, "Margaret," in February puts four drilling barges in service for that firm. "Margaret" was commissioned in Mobile, Alabama, and is capable of drilling in 65-ft water. The El Dorado, Arkansas, company also operates "Mr. Charlie," "John Hayward," and "St. Louis."

★ **"Mr. Arthur,"** Coral Drilling Company's first drilling barge, was commissioned in late February. The $4,000,000 drilling unit is an elevated deck, submersible and mobile type drilling vessel, capable of drilling in water depths up to 70 ft. First contract for "Mr. Arthur" is with the California Company. Christening was in Mobile, Alabama, yards.

★ **Hummingbird Drilling Company** has been organized in Houston, Texas, with a district office in Magnolia, Arkansas. W. A. Byrd of Magnolia is president, and W. A. Horton and Gilbert M. Turner, both of Houston, will serve as vice presidents.

Rotary Rigs Operating in Oil Fields of United States and Canada*

	Jan. 14	Jan. 21	Jan. 28	Feb. 4	Feb. 11
Alabama	12	11	10	8	6
Arkansas	20	18	17	10	14
Arizona	0	0	0	0	0
California	102	102	99	106	104
Colorado	38	41	43	42	36
Florida	1	2	2	2	2
Georgia	0	0	0	0	0
Idaho	1	1	1	1	1
Illinois	45	41	38	46	24
Indiana	5	4	3	0	0
Iowa	1	1	1	1	1
Kansas	154	147	144	139	150
Kentucky	10	12	7	2	3
North Louisiana	44	43	47	36	49
South Louisiana — Land	283	296	291	302	298
South Louisiana — Offshore	104	104	100	102	104
Total Louisiana	431	443	438	440	451
Maryland	1	1	1	1	1
Michigan	10	10	10	9	12
Missouri	0	0	0	0	0
Montana	21	21	20	23	23
Mississippi	19	23	21	22	17
Nebraska	23	24	27	26	30
Nevada	2	2	1	1	1
New Mexico	110	100	112	120	122
New York	0	0	0	0	0
South Carolina	0	0	0	0	1
North Dakota	29	29	27	23	21
Ohio	0	0	0	0	0
Oklahoma	244	230	233	218	209
Oregon	0	0	0	0	0
Pennsylvania	6	9	9	10	10
South Dakota	1	1	0	0	2
Tennessee	0	0	0	0	0
Texas Gulf Coast — Land	233	243	223	206	205
Texas Gulf Coast — Offshore	6	6	6	7	7
West Texas	352	346	349	358	370
North Texas	311	307	316	297	292
East Texas	59	55	62	52	54
Total Texas	961	957	956	920	928
Utah	29	32	38	35	32
Washington	1	1	1	1	1
West Virginia	2	2	2	2	2
Wyoming	51	48	49	48	46
United States	2,330	2,313	2,310	2,264	2,250
Western Canada	226	229	239	238	244
Grand Total	2,556	2,542	2,549	2,502	2,494

*As reported to the American Association of Oilwell Drilling Contractors by Hughes Tool Company.

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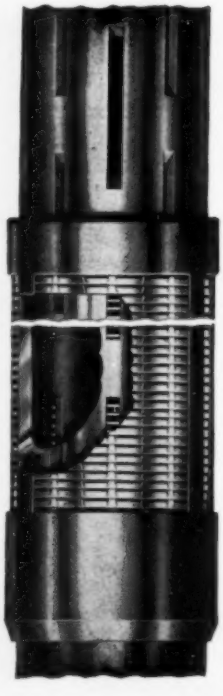

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SATURDAY, AUGUST 25, 1956.

SALAM

THE STAFF WEEKLY NEWSPAPER AND OFFICIAL NOTICES OF THE BRITISH MALAYAN PETROLEUM COMPANY LTD. AND SARAWAK OILFIELDS LTD.

NEW SHIFT TEAMS WILL RUN LUTONG REFINERY

A reorganisation of staff responsibilities took place last Monday at Lutong Refinery, designed to [illegible] supervision of the refinery's [illegible] operations.

Seven Laboratory [illegible] in the refinery have been promoted to Regional Staff: Peter Mayor and [illegible] Samat (Distillation Assistant Foremen), [illegible] and Lawen ak. Chundi (Laboratory [illegible]), Ong Kim Tiak and Aman [illegible] (Distillation Assistant Foremen), Brokie bin Jahuddin (Local Refinery Assistant Foreman).

In routine refinery [illegible] tions are now [illegible] series of [illegible] prised of Supervising Foreman and three Assistant Foremen — Distillation, Distillation and [illegible].

As from September 5, it is planned to transfer the Oil Accounts Section to the refinery. There it will work under the Refinery Technologist and the Senior Installation Supervisor. From [illegible] an Oil [illegible] Clerk will join each Shift Team. Thereafter, these Shift Teams will be responsible for all routine refinery [illegible], crude receipts, distillation runs, tank farm movements, ships, laboratory testing and oil accounting. The same men will work together in the same shift cycle and will thus keep together as a team.

By grouping all routine activities under the Shift Team, Technologists and Section Heads will have more time to concentrate on programming, future planning, and the efficient administration of their sections.

The reorganisation is the result of the growing operations of the Refinery. Two years ago receipts were [illegible] of the present figure; Seria's Gas Plant was a thing of the future and therefore no gasoline was being processed and no naphtha was produced. Furthermore, the old sea-loading pump station was still in use, and relatively small oil tankers were calling at Lutong.

To-day, the refinery deals with spiked naphtha, two grades of gasoline, an extra residue grade, and faster loading of much larger ships with night berthing imminent. Forward programming is closely scheduled with Singapore, Sydney, Geelong and Clyde — more products and closer co-ordination.

Parallel with these advances, there has been the necessity to step up efficiency, and increase the study of economics, pollution and waste problems.

These expanding activities have meant more work for the Section Heads and Technologists and the new reorganisation is designed to free them from the routine day-to-day operations.

Dick → It looks like Security Bits are setting all kinds of records. Better run them on your next well. JCM

WELL DRILLED IN NINE DAYS

Well 439 in the Labour housing area has been the fastest-drilled medium-depth vertical hole in the Seria Field to date.

The number of days from spudding-in to reaching the final depth of 5576′ was just over nine days. Well 423 reached this depth 10½ days after spudding-in, and Well 405 took 11 days.

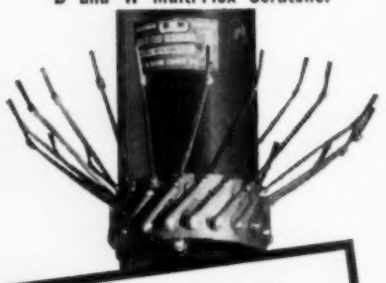
A new type of bit was used for the first time in the area—a long-toothed Security S3J tricone jet bit.

Well 439 is a vertical well, and the average net rate of penetration in 9⅞″ hole (i.e. after setting 10¾″ casing) was 67.4 ft/hour, from 1505 feet to 5107 feet, compared with 64 ft./hour over the same interval in the previous fastest well, No. 423.

Five bits were used to drill from 1505′ to 5556′ — an average of 810′.

The drillers were: A.A. Ahmed Assan, M. Krishnan, K. R. Govindan, Jamal Mohd. (relief driller).

B and W Multi-Flex Scratcher



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RUNNING TOUR with MEN in the INDUSTRY

▸ The Pacific Coast land department of Shell Oil Company has made temporary assignments which shift four staffmen. **Durland Clark,** land manager at Bakersfield, California, for the San Joaquin division, to spend six months in Shell's New York headquarters on special assignment. **Arthur E. Nelson, Jr.,** district land agent for Shell at Sacramento, California, serves as acting land manager at Bakersfield during Clark's absence. **Charles W. Barnes,** northwest division landman at Seattle, Washington, replaces Nelson at Sacramento as acting land agent. **Roger A. Chaffin,** landman in the coastal division at Ventura, California, acting for Barnes at Seattle. **J. Russell Harman,** veteran superintendent in the Shell Oil fields of California, has retired after 37 years of service. **Bertrand F. Henderman,** assistant manager in the credit department of Los Angeles district, has been honored for 30 years of service with Shell. He was presented with the 30-year service award, a Shell pecten emblem containing two diamonds.

▸ Four promotions have been announced in Phillips Petroleum Company's land and geological department. **Edwin Van den Bark,** formerly division manager at Midland, Texas, becomes manager of the southwest region, with headquarters in the company's Bartlesville, Oklahoma, offices, replacing **H. D. Brookby,** who was recently promoted to manager of the foreign department. At Midland, **C. F. Keller,** assistant division manager, succeeds Van den Bark as division manager; **A. M. Schiemenz** becomes assistant division manager and division exploration geologist; and **R. W. Barker** has been named division landman.

▸ **Dr. Enver Necdet Egeran** has been appointed assistant to the manager of Mobil Exploration Mediterranean, Inc., Socony Mobil Oil Company's Turkish producing affiliate. He came to Mobil Exploration Mediterranean from the Turkish government where he served as vice president of the petroleum administration.

▸ **Richard V. Hollingsworth,** of the Paleontological Laboratory, Midland, Texas, has been named president of the Society of Economic Paleontologists and Mineralogists. Serving with Hollingsworth on the 1957-58 Council will be **Robert R. Shrock,** Massachusetts Institute of Technology, Cambridge, Massachusetts, as part-president; **Stuart A. Levinson,** Humble Oil and Refining Company, Houston, Texas, as vice president; **Samuel P. Ellison, Jr.,** University of Texas, Austin, Texas, as secretary-treasurer; **M. L. Thompson,** University of Kansas, Lawrence, Kansas, as editor of the *Journal of Paleontology;* and **Jack L. Hough,** University of Illinois, Urbana, Illinois, as editor of the *Journal of Sedimentary Petrology.*

The research committee of SEPM has elected **Philip Henry Keunen** as correspondent and **Henry V. Howe,** Louisiana State University, Baton Rouge, Louisiana, as an honorary member.

William R. Walton, Gulf Research and Development Company, Pittsburgh, Pennsylvania, receives the Best Paper Award from SEPM for his paper entitled, *"Ecology of Living Benthonic Foraminifera, Todos Santos Bay, Baja, California."* **Louis F. Dellwig,** University of Kansas, Lawrence, Kansas, receives the award for his paper entitled, *"Origin of the Salina Salt of Michigan."*

▸ **W. D. C. Mackenzie,** Imperial Oil, Ltd., Toronto, Canada, and **E. D. Loughney,** The British American Oil Company, Ltd., Toronto, were presented with honorary life membership scrolls in the Canadian Petroleum Association. The presentations were made by the Honorable **J. J. Bowlen,** lieutenant-governor of Alberta.

▸ Great Basins Petroleum Company has elected the following directors: **Arthur P. Adkisson,** Long Beach, California; **Dwight C. Baum,** Los Angeles, California; **H. C. Brown,** Odessa, Texas; **Thomas W. Evans,** and **Ross J. Ferrer,** both of Beverly Hills, California; **C. G. Glasscock, Jr.,** Denver, Colorado, **R. G. Greene,** Los Angeles, California; **Irwin R. Harris,** St. Louis, Missouri; **Clinton LaTourrette,** Los Angeles, California; **W. E. Morgan,** Denver, Colorado; **J. R. Pemberton,** and **Joseph L. Ryons,** both of Los Angeles, California.

▸ **J. E. Bailey,** chief petroleum engineer for the southern division of Tidewater Oil Company, has been sent by his company to Iran to serve two years as senior technical adviser to the National Iranian Oil Company.

▸ **Wilbur B. Harrison,** president of Apex Petroleum Corporation, Ltd., has been named president of the California Stripper Well Association. Harrison was elected by the board of directors of the association to fill the vacancy caused by the resignation of **Victor L. Norman,** long time president of the group, who resigned because of illness.

▸ **B. L. Ryan,** executive assistant to the vice president of Shell Oil Company in Houston, Texas, has retired after 36 years of service.

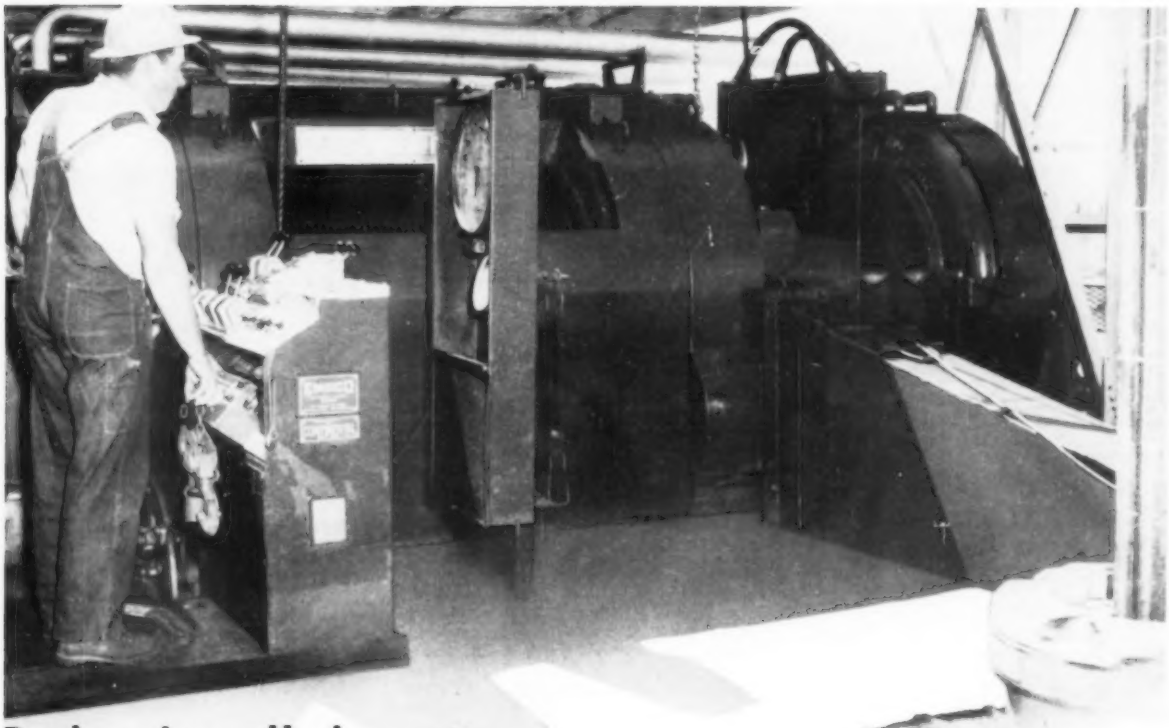
▸ Administrative functions of the Spindletop area office and the High Island area office of Stanolind Oil and Gas Company will be consolidated. Field superintendent for the combined areas will be **H. W. Hurley,** who is now superintendent of the High Island area. Former superintendent was **W. G. Leach,** who retired.

▸ **John D. Moore** has been appointed to the engineering staff of W. C. Fatjo, Inc., Lafayette, Louisiana. He formerly was associated with Loffland Brothers Company in Houston, Texas. He is a graduate of the University of Tulsa, Tulsa, Oklahoma.

▸ **Edward H. Leede** has been named the new division manager in Midland, Texas, for White Eagle Oil Company. He was formerly division landman for White Eagle in the company's headquarters in Tulsa, Oklahoma.

▸ **Von Rhea Frierson,** a former employee of the Sahara Petroleum Company in Egypt, has joined the geology staff of the Oasis Oil Company of Libya, a subsidiary of the Ohio Oil Company.

▸ The 1957 Frank Newman Speller Award for achievements in corrosion engineering will be given to **Walter F. Rogers,** chief chemist, Houston production division chemical laboratory, Gulf Oil Corporation, Houston, Texas. The 1957 Willis Rodney Whitney Award will go to **Carl Wagner,** professor of metallurgy at Massachusetts Institute of Technology, Cambridge. The awards will be presented during the NACE annual banquet March 13 at the Sheraton-Jefferson Hotel, St. Louis, Missouri, during the association's 13th annual conference and exhibition.



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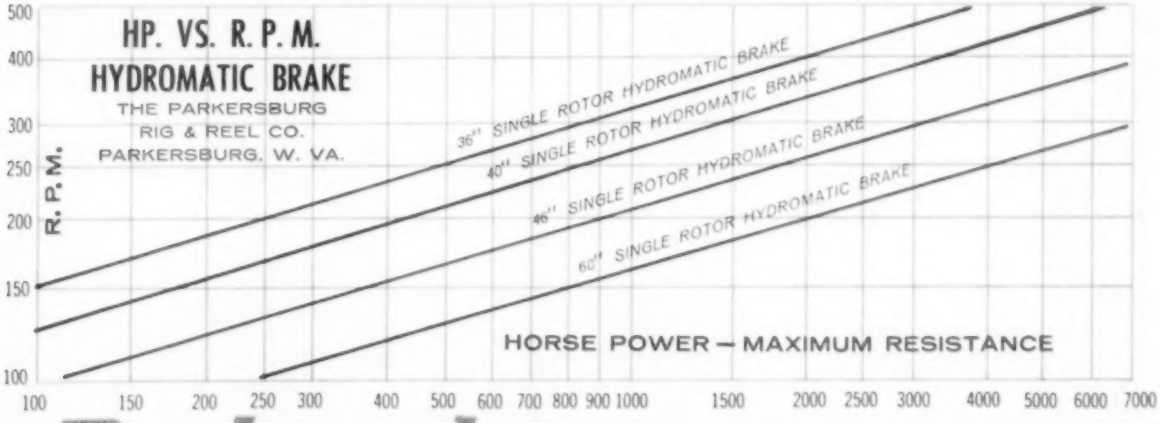

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Personals

Hugh B. Hodges, retired Tulsa drilling contractor and independent producer, has been elected a director of Sunray Mid-Continent Oil Company. He takes the board position recently vacated by **James K. Ellis,** San Antonio, Texas, who became a director of Suntide Refining Company, Corpus Christi, a Sunray affiliate.

R. E. Dumas Milner, Harold R. White and **Julian Alexander,** all of Jackson, Mississippi, have announced formation of Milner-White Oil Company with offices in the Milner Building, Jackson, Mississippi. The new company will engage in general oil operations, primarily in Mississippi and the southeastern states.

Earl S. Neal, an executive in oil producing activities of Standard Oil Company (New Jersey) and its affiliates, will take up a new assignment as deputy representative on Middle East matters for the company, in London, England. To accept the new post, Neal has resigned as a director of Imperial Oil Limited.

Loyd Wagner has been made district drilling superintendent for Warren-Bradshaw Exploration Company in Midland, Texas. **Levi Schrock** has moved from Midland to the Four Corners area, with headquarters in Farmington, New Mexico. He is district drilling superintendent there.

Harry H. Sisson has been appointed chief geophysicist of Monterey Oil Company. He will maintain headquarters in Los Angeles, California, and will be responsible for the company's entire seismic exploration program. He came to Monterey from the Robert H. Ray Company of Houston, Texas, for which he had officiated during the past five years as chief seismologist.

Harold V. Summers has joined Cosden Petroleum Corporation's production department as a reservoir engineer in Big Spring, Texas. Summers, a Texas A&M graduate, was formerly employed by the Standard Oil Company of Texas.

E. E. Ives has been appointed to the new position of division superintendent of production for Cities Service's North Oklahoma area and **Hugh L. Riles** to the new position of division superintendent of production for the North Texas-South Oklahoma area.

Earl J. Whitaker of Northern Pacific's oil development department has been elected chairman of the Billings petroleum section, AIME for the year 1957. Other officers named are **Maury Anderson** of Northern Pacific, first vice chairman; **Joe McClure** of Dowell, Inc., second vice chairman; **Gary Brown** of Mobil Producing Company, secretary-treasurer. Two members elected as directors are **Don Bishop,** Lane Wells, Inc., and **M. E. Welbourn,** Shell Oil Company. **W. A. Scott** of Shell Oil Company, retiring chairman, also becomes a director.

Graham B. Moody, consulting geologist, Berkeley, California, has been named president of the AAPG. Other new officers are: **Byron W. Beebe,** Keating Drilling Company, Oklahoma City, Oklahoma, vice president; **William J. Hilseweck,** Blackwood and Nichols, Dallas, Texas, secretary-treasurer, and **Sherman A. Wengerd,** associate professor of geology at the University of New Mexico, Albuquerque, editor of the AAPG monthly bulletin of petroleum geology. **Theodore A. Link,** president of Cree Oil of Canada, Ltd., is the retiring president.

J. E. Vaeth, veteran Fort Worth, Texas, oil man and executive vice persident and director of Southern Production Company, Inc., until the acquisition of its oil and gas properties by Sinclair Oil & Gas Company, has resigned from an executive position with Sinclair to become an independent oil operator.

Frank K. Mytinger has been appointed district landman for Cities Service Oil Company at Wichita Falls, Texas. He has been with Cities Service since 1951 and served as landman at the company's Roswell, New Mexico, office at the time of his advancement. **George Sewell, Jr.,** is being transferred from Bartlesville to Roswell to succeed Mytinger there as landman. **Frank Rice, Jr.,** a landman in the Bartlesville office of Cities Service is being transferred to Amarillo, Texas, as landman.

Frank Richardson has been appointed manager of the production and exploration department of Lion Oil Company, a division of Monsanto Chemical Company. Richardson has been assistant to J. E. Howell, who is vice president in charge of production and exploration for Lion Oil.

Robert I. Williams, formerly manager of the company's Rocky Mountain region, has been named assistant manager of the department and will transfer from Denver, Colorado, to El Dorado, Arkansas. **Eugene L. Maxwell** replaces Williams as manager of the Rocky Mountain region. Maxwell, who has been manager of the Central Region with offices in Wichita, Kansas, will be stationed in Denver. Replacing him in Wichita is **Robert P. Evans** who has been assistant manager of the Southwestern region with headquarters in Midland, Texas.

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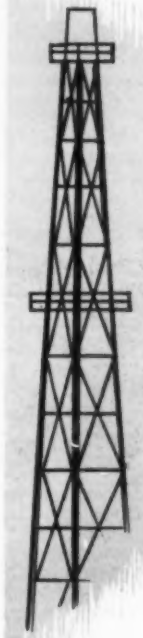

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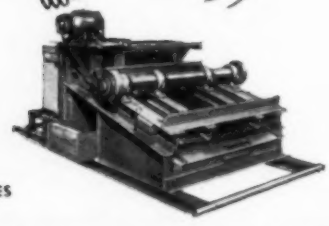

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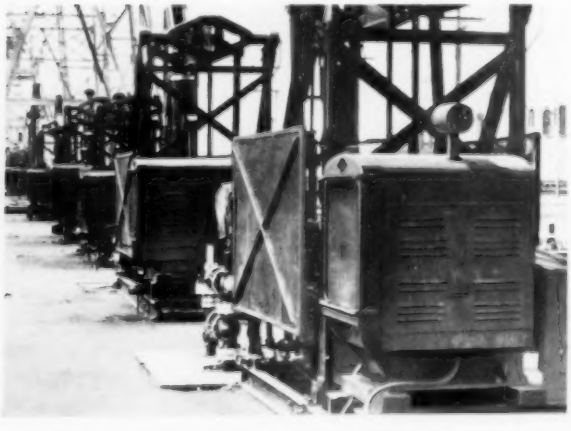

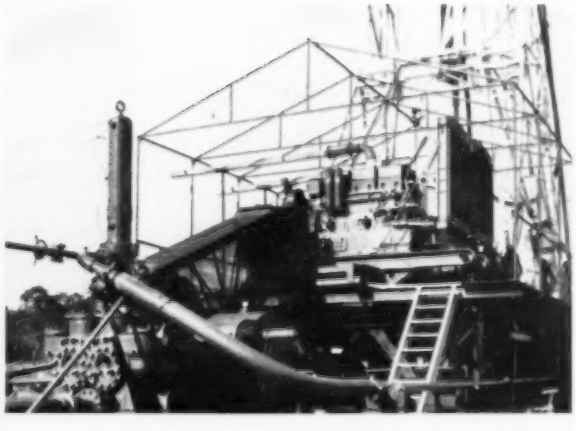

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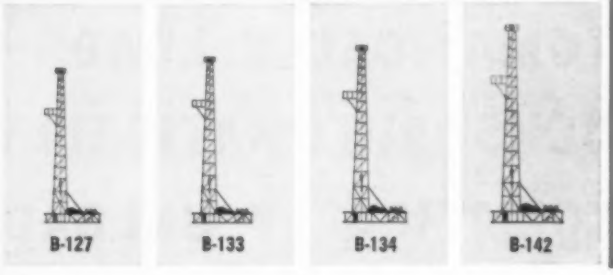

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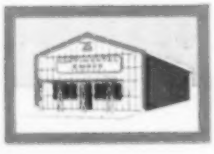

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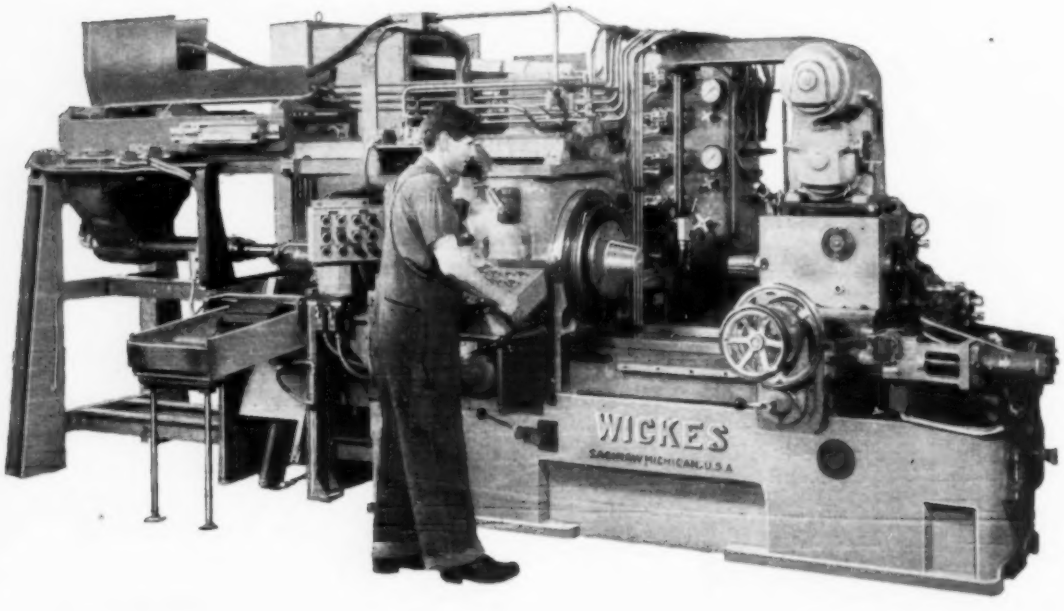

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Well	Formation	Gallons Fracturing Fluid	Pounds Sand	Injection Rate BPM	Production, BOPD Before	After	30-60 Days After	6 Months After
A.	San Andres	10,000	10,000	5	2	28	35	—
B.	San Andres	15,000	21,000	5	4	54	120	65
C.	Springer Sand	6,000	12,000	3	8	49	51	51
D.	Penn. Cgl.	6,000	6,000	4	*	345**	144	80
E.	Miss. Chat	6,000	12,000	10	Dead	435	306	192
F.	Miss. Chat	6,000	10,000	5	10	—	33	30
G.	Miss. Chat	6,000	12,000	10	*	—	330**	360***
H.	Clear Fork	10,000	[illegible]	[illegible]	[illegible]	—	90	51
I.	Sussex "A"	[illegible]	[illegible]	[illegible]	[illegible]	53	45	52
						9	180	99
						9	67	51
						0	80	68
							49	30

More than 10,000 success stories fracturing with Adomite

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Seals the fracture face . . . minimizes fluid loss . . . no damage to formation.

Longer fractures . . . deeper penetration of sands.

Fewer sandouts . . . reduces fluid loss in rock matrix, prevents buildup of sand concentrations in the fractures.

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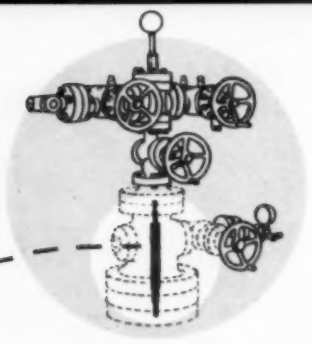

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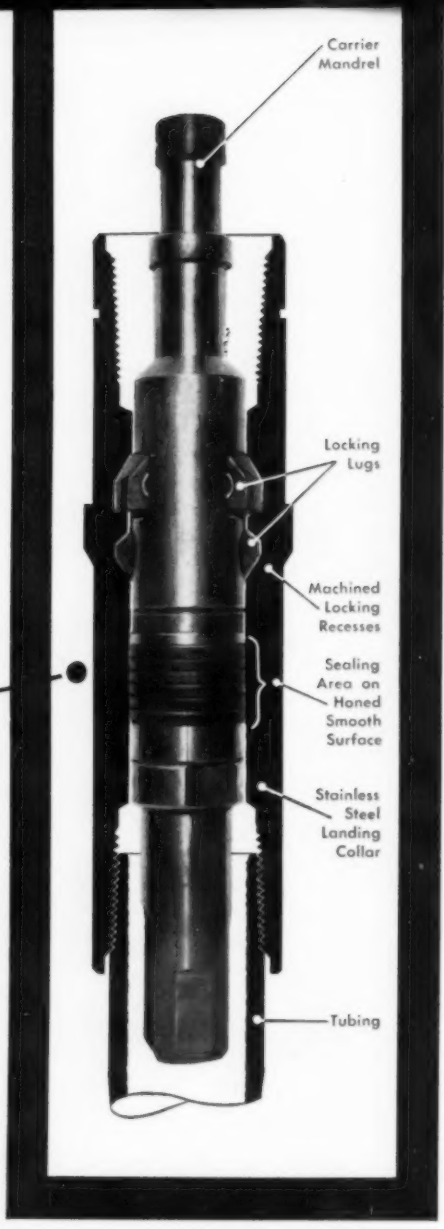
in Back Pressure Valves . . .



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. . . Back Pressure Valves differ from all other tubing plugs because McEvoy's seal on a honed surface in the landing collar and *not* on the rough tubing wall. This important difference permits a more perfect seal to be formed, assuring you of positive protection during all completion operations.

The removal of blowout preventers and installation of the Christmas Tree are carried out with full pressure control! These McEvoy-Otis* Back Pressure Valves may be removed under pressure and the well brought in. The valves may be re-installed or removed under pressure *at any time* during the life of the well.

The McEvoy-Otis* Back Pressure Valves are designed to withstand 15,000 P.S.I. and are available for all single and multiple completions.

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2. **Locks into specially Machined (selective) Recesses, does *NOT* depend upon threads or slips.**
3. **Tubing Bore and Annulus are under complete control at all times.**
4. **Standard Tubing Size Master Valves are used . . . does *not* require oversize Master Valves and Tree.**
5. **Drilling mud can be displaced from the tubing before landing, avoiding swabbing operations.**
6. **The Landing Collars are the *full bore* of the tubing string.**
7. **Wellhead Equipment (Christmas Tree) may be removed to re-work or re-complete without killing the well. McEvoy, Otis, or your own personnel can safely set, remove and operate this simple equipment.**
8. **The McEvoy-Otis Plugs and Landing Collars are Modified Type "S" (Otis) and are selective. They will not interfere with or accept regular Otis Plugs and other down-hole equipment.**

You are assured dependability and positive protection for the life of your wells by specifying and using **McEvoy-Otis Back Pressure Valves.**

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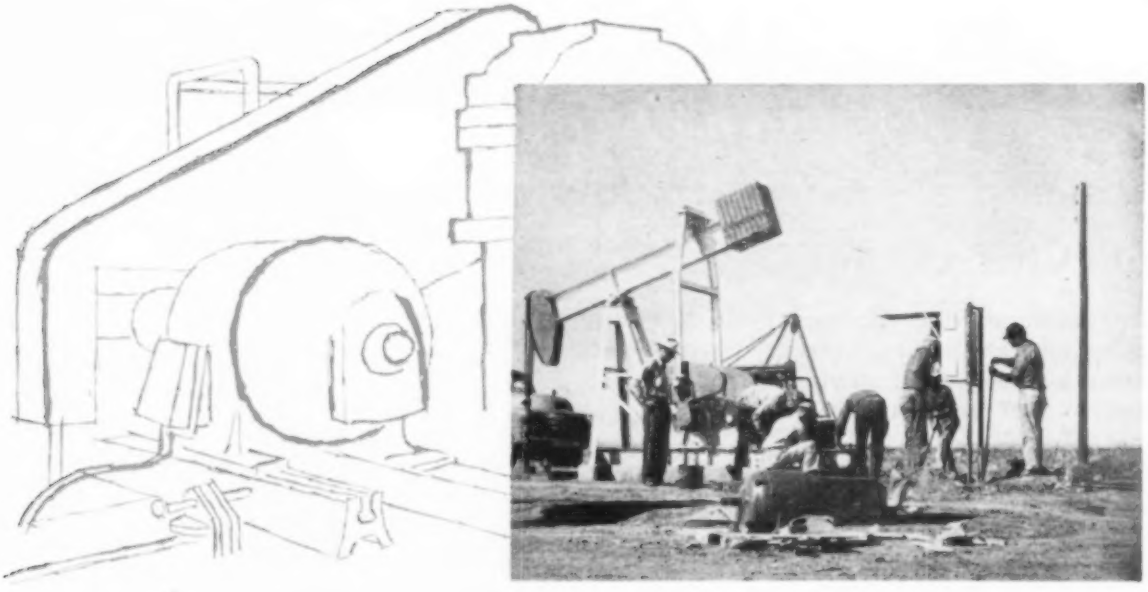

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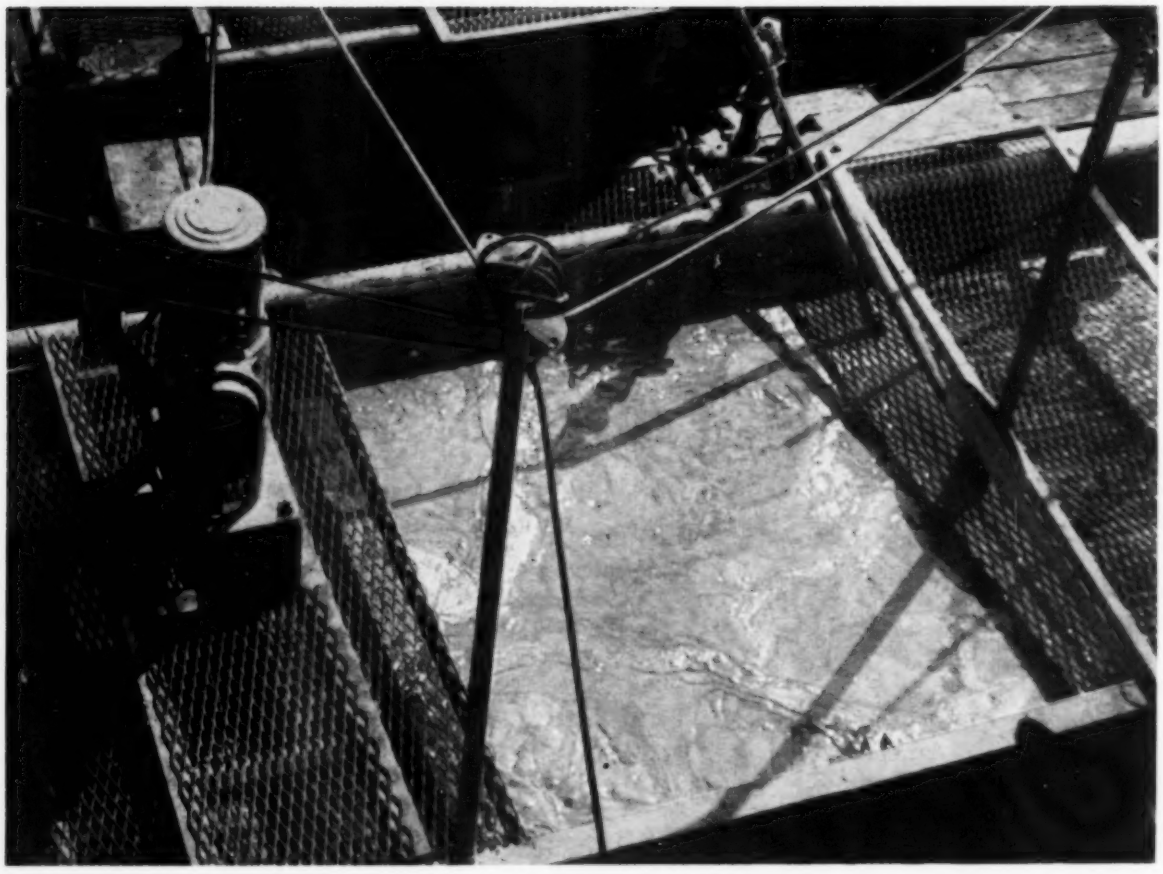

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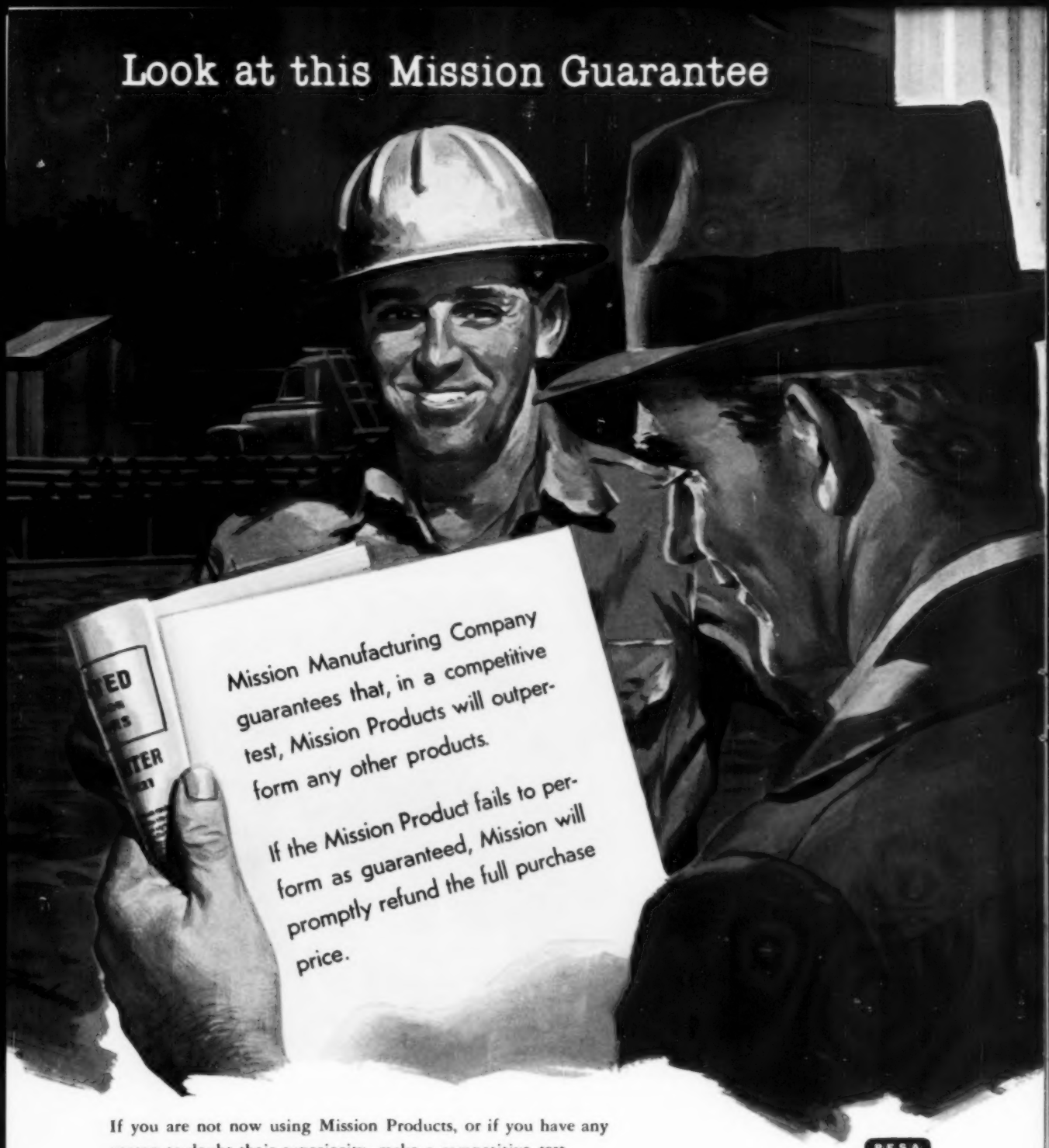
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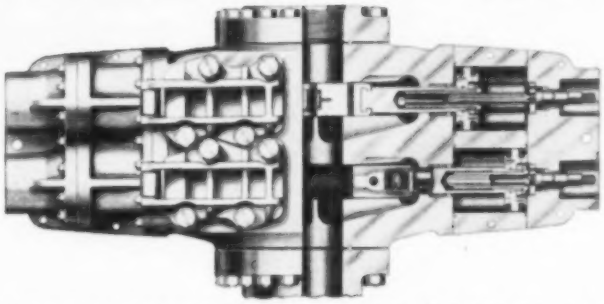

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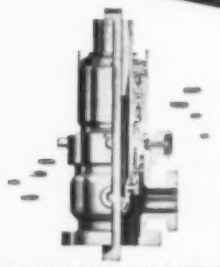
• Completely Enclosed Design . . . Direct Hydraulic Drive . . . Quick-Draining Compartment Bottoms . . . these and other exclusive features make Shaffer Hydraulic Cellar Control Gates outstanding in the industry.

Available in a complete range of sizes and pressure ratings.



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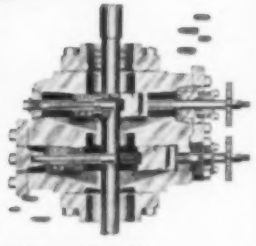
• Quick-Releasing Bonnet permits passing bits, reamers, other large-diameter tools through the unit quickly and easily.

Available in 2 types —a complete size range!

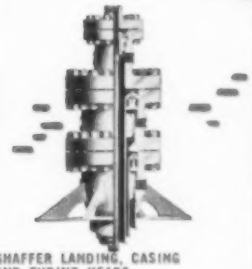


SHAFFER MECHANICAL CELLAR CONTROL GATES

• Available in both *Double* (illustrated above) and *Single* types for operation by an air motor drive utilizing the air supply available at most rigs — *plus manual stand-by protection!*

• Even in sizes as large as 13⅝" (12" Series 900) the Double type requires less than 29" cellar height, the Single less than 17½"!

• Rams are changed by simply removing one end cover . . . quick-draining ram compartments prevent accumulation of detrimental mud and sand . . . many other unique features make these gates top choice wherever *mechanically*-operated cellar control gates are preferred!



SHAFFER LANDING, CASING AND TUBING HEADS

• Meet every requirement for modern, compact casing and tubing suspension in wells of all depths.

• Available in various types and packing arrangements. Base Heads and Combination Base, Casing and Tubing Heads are available for combining several units into one where space is at a premium.

Shaffer also provides a full line of modern Tubing Heads, Multiple Zone Hook-Ups and other equipment to complete your pressure control installations.

SHAFFER ADJUSTABLE FLOW BEANS

• These units *pioneered* the adjustable flow bean principle and are still unequalled in operating features.

• Available with Conical, Micro and electrically-heated Thermo Tips in both regular and hard metal designs to meet various drilling, production and refining applications. A choice of all popular sizes — in both flanged or screwed connections!

ALSO SHAFFER FISHING TOOLS are world famous for their simplicity, dependability and unique advancements . . . tools that combine into **one** coordinated unit the operating principles of **several** different tools. Get full details from your nearest Shaffer representative. Or write direct!

SHAFFER

HIGH PRESSURE DRILLING AND CONTROL EQUIPMENT • FISHING TOOLS THAT EXCEL

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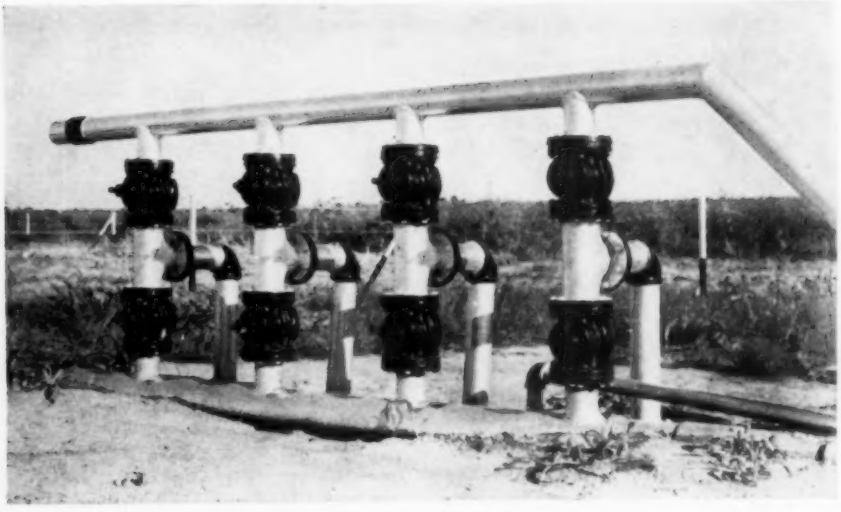
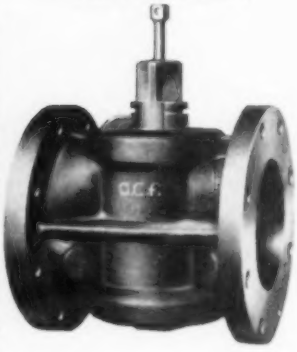
OKLAHOMA CITY, OKLAHOMA, Shaffer Tool Works, 4201 South Shields Boulevard
FARMINGTON, NEW MEXICO, Shaffer Tool Works, Post Office Box 546
CASPER, WYOMING, Shaffer Tool Works, Post Office Box 1788
EXPORT SALES OFFICE: Shaffer Tool Works, 500 Fifth Avenue, New York, N. Y., U. S. A.

34 years OF OIL TOOL LEADERSHIP



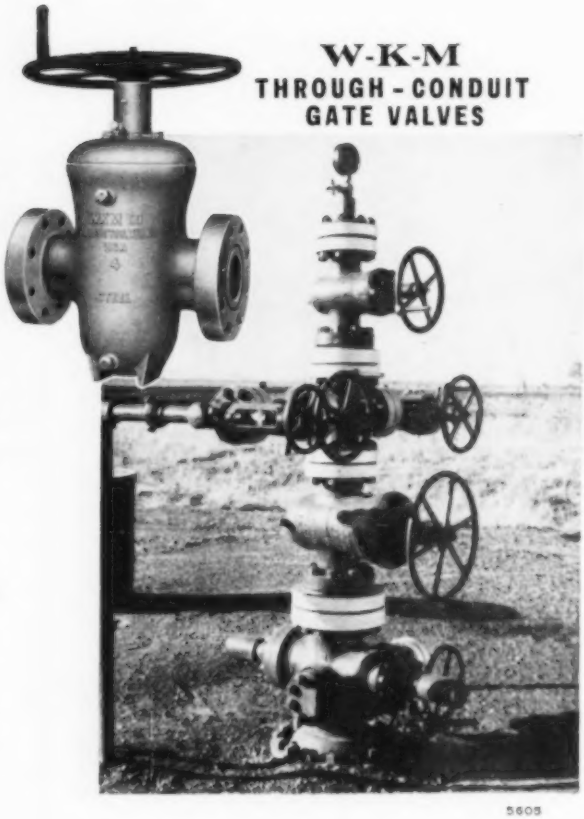
acf LUBRICATED PLUG VALVES



NOW-

Both High and Low Pressure Valves from W-K-M

W-K-M THROUGH-CONDUIT GATE VALVES



For your Christmas Trees, flow lines, and wherever else high pressures must be safely and positively controlled, there are the famous W-K-M- through-conduit gate valves, in working pressures from 1,000 to 15,000 pounds.

acf lubricated plug valves, of steel, semi-steel, and special metals, with round or rectangular ports, in working pressures from 200 to 500 pounds — are the perfect companion valves for gathering lines, manifolds, headers, and similar low pressure installations.

Because you need the finest in service wherever valves are required, you will be way ahead when you specify W-K-M or acf valves for their respective applications.

5605

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W-K-M THROUGH-CONDUIT GATE VALVES	acf LUBRICATED PLUG VALVES	KEY RETURN BENDS AND FITTINGS

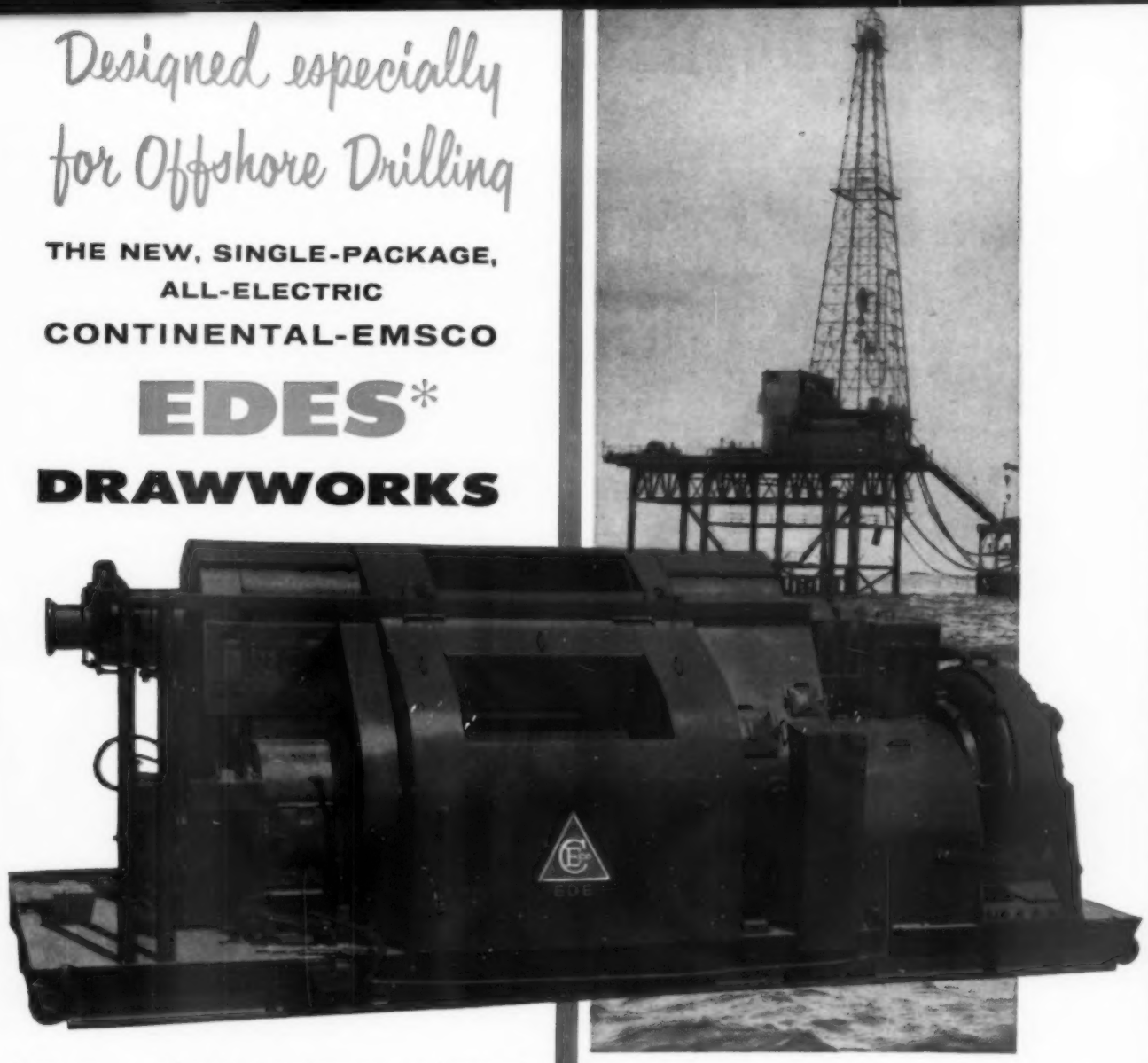
Designed especially for Offshore Drilling

THE NEW, SINGLE-PACKAGE, ALL-ELECTRIC

CONTINENTAL-EMSCO

EDES*

DRAWWORKS



Compactness, dependable performance, and ease of maintenance are of utmost importance in offshore drilling. Continental-Emsco, pioneer of many developments in drilling machinery, particularly for offshore, presents the compact, powerful EDE Rig which combines many advantages in a single space-saving package. To insure continuous, uninterrupted service we also recommend companion offshore items by Continental-Emsco, the PJ 27½" Rotary Table, Type L cone roller bearing swivel, and MA Series crown and traveling blocks. Learn why Continental-Emsco equipment is standard practice in many offshore rigs and platforms. For detailed engineering data, call Continental-Emsco today.

Investigate these unusual features

1. A complete and compact unit with 4-speed drawworks.
2. Built-in electric motor package.
3. Totally enclosed pressure lubricated drives.
4. Sixty-inch brake rims with total effective braking area of 2,640 square inches.

* 5. Optional built-in Sandreel.

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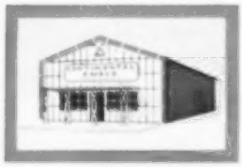

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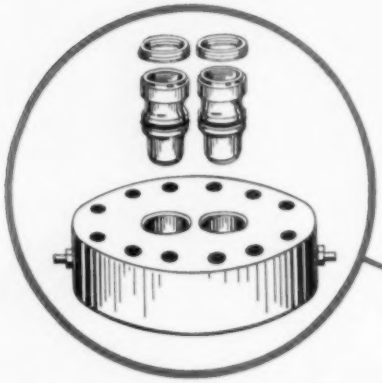
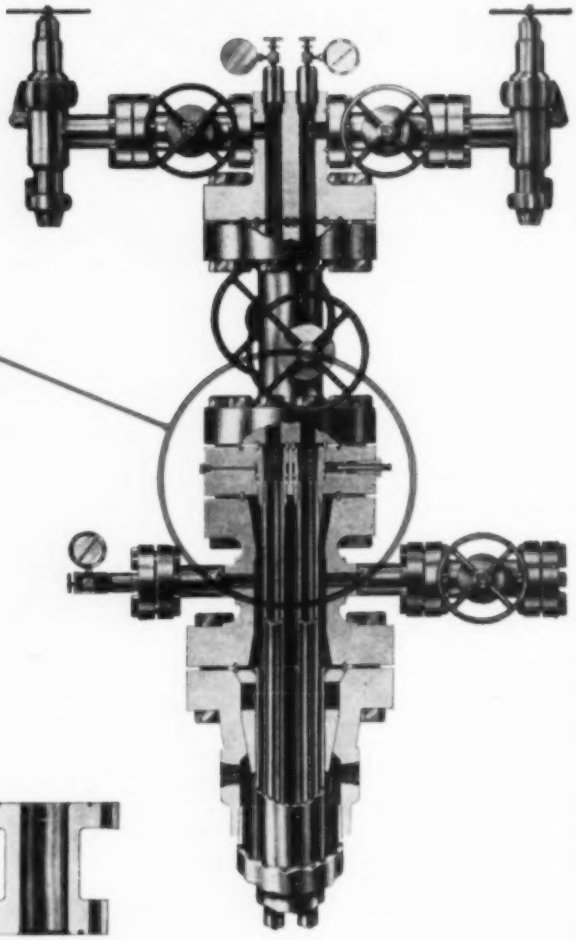
Representatives in All Principal Oil Fields of the World

R-702

RECTOR Dual-String Hanger Flange

Outstanding Simplicity and Flexibility, plus the FAMOUS Rector Metal-to-Metal Seal





SIMPLICITY: The flange has two full opening tapered bores in which the strings are suspended by threaded mandrels. This eliminates mating and sealing two tubing hangers in a single, large bore. Each string can be suspended, temporarily sealed, and held down independently of the other assuring maximum ease of installation with complete control of well.

FLEXIBILITY: Regular 2" API upset tubing can be run or pulled through the bores in the flange.

METAL-to-METAL SEALS: Each mandrel is independently sealed by a metal seal ring in the groove at the junction of mandrel and flange. This metal-to-metal sealing arrangement also acts as a hold-down. "O" Rings on the mandrel provide a temporary seal during completion and permit testing the seal after Christmas Tree is installed. Mandrels are grooved for hold-down locking screws, which are optional in the flange.

• **Rector Dual-String Hanger Flanges are available in Nom 6 and Nom 8 sizes in any series. Mandrels are interchangeable.**

For maximum simplicity and flexibility of dual-string suspension, plus the metal-to-metal seal that never requires maintenance or replacement, specify a Rector Dual-String Hanger Flange in your dual completion Christmas Tree.

Off-Set Adapter Spool permits use of regular preventer equipment with alignment directly over each individual bore while running and pulling tubing. After first string is run, Adapter Spool can be rotated to center directly over the other bore.

25 YEARS

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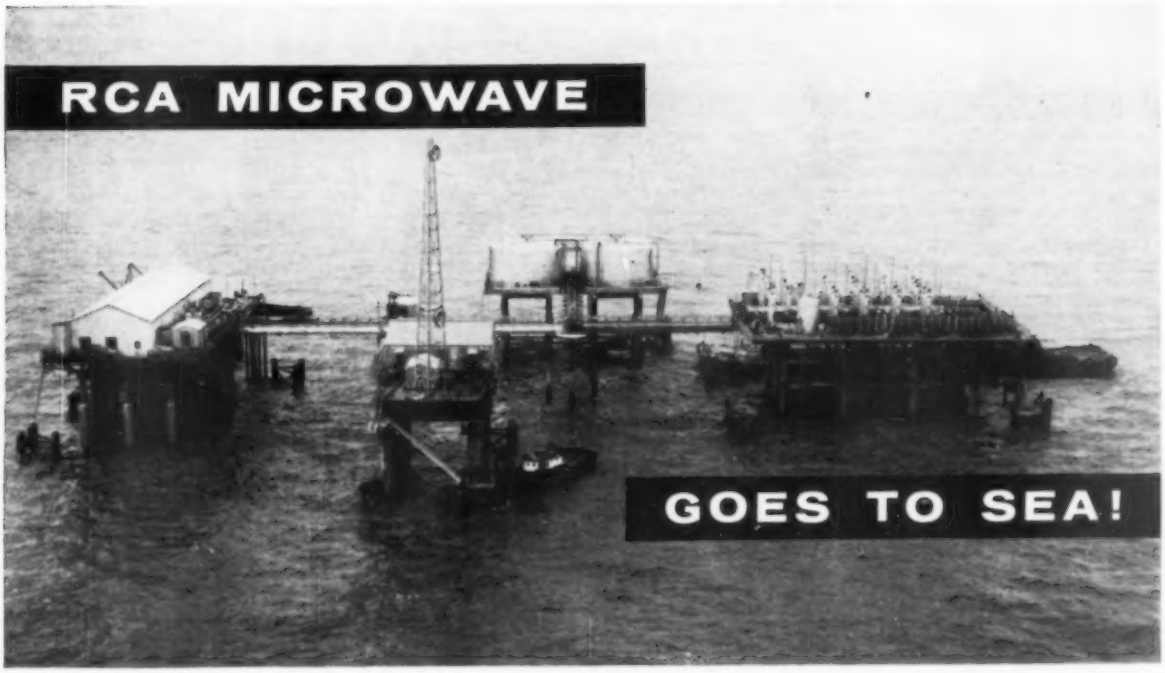
Houston Plant: 2215 Commerce St.

REPRESENTATIVES IN ALL ACTIVE FIELDS



Magnolia Co. Installing Oil Industry's First Offshore Microwave Radio Communications

To coordinate production and pipe line operations in the Gulf of Mexico off Morgan City, La., a five-station, four-hop RCA Microwave Radio System, now under construction by Magnolia Petroleum Co., Dallas, will span a distance of more than 75 miles and provide approximately 55 miles of over-water communications.

Dependable RCA Microwave Radio was selected as the communications medium because of crowded VHF radio conditions in the area; also to provide facilities for additional services, such as telemetering and equipment control.

The system will be extended from Morgan City to Burns Terminal, 19 miles away, then 24 miles out into the Gulf of Mexico to Magnolia's Block 51 oil field. From Block 51 the system will extend 23 miles to Block 126 and on to Block 128, nine miles away. RCA CW-20 equipment, operating in the 2000 mc band will be used, with a capacity of 30 channels.

RCA Microwave Specialists will be glad to answer any questions and help plan your installation. Mail coupon for further particulars on use of RCA Microwave Radio in utilities, pipe lines, turnpikes and other applications.

RCA MICROWAVE RADIO . . . performance proved in more than a million channel miles of operating systems throughout the world.

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Please send me latest literature on
☐ RCA Microwave Radio for use in _____

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COMPANY _____

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CITY _____ ZONE _____ STATE _____

☐ Have representative contact me.

FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD

NEW Drilling and Producing Equipment

Coupling for Grooved End Pipe. A new flexible coupling for grooved end pipe is now marketed by Charles E. Manning.

In sizes 1-in. to 8-in., the Alumiron Coupling is available in either malleable iron or aluminum and is furnished with Buna N or Neoprene gaskets. For use on steel, aluminum, cast iron, wrought iron and spiral weld pipe, the Alumiron can be quickly coupled or uncoupled by means of two bolts which pass through the coupling halves. Use includes long, surface runs over rough, uneven country on service pipe to drilling rigs, Christmas tree, tank farms, stock and transfer lines, gathering lines, and waste disposal. *Charles E. Manning Company.*

Circle number (1) on reply card.

Fittings Help Cut Evaporation Losses. A new line of fittings, designed especially for storage tanks, is now being manufactured by Wheaton Brass Works.

Wheaton Gage Hatches provide automatic closing and vapor-tight sealing, effecting a definite reduction in evaporation losses. These hatches have resilient seal in the cover, which cushions the impact of closing and positive tightness. Other new tank fittings include screened Free Vents, which furnish unimpeded free flow of air and vapor; Breather Vents, which feature diaphragm seals for positive tightness; Water Drain Valves, and Automatic Tank Gages. *Wheaton Brass Works.*

Circle number (2) on reply card.

Water-Oil Metering Vessel. Vol-U-Meter, the "FV," has been developed by Oil Metering and Processing Equipment. Essential differences between the new unit and the "CV" Vol-U-Meter are: (1) The shape of the vessels and (2) the type of liquid-level controls. The FV Vol-U-Meter has a reduced-diameter neck top and bottom to enhance metering accuracy. FV unit has two liquid-level control pilots, one at the upper dumping level and one at the lower dumping level. *Oil Metering and Processing Equipment Corporation.*

Circle number (3) on reply card.

Adds Two New Power Units. International Harvester has added two power units to its expanding line. New four-cylinder units, termed the U-175 and the U-281, are available with equipment for operation on gasoline, LPG, natural gas, distillate, or kerosine. U-175 develops 50 hp at 2000 rpm on gasoline with a compression ratio of 6.8 to 1. The U-281 produces 67.5 hp at 1800 rpm on gasoline with a compression ratio of 6.6 to 1. *International Harvester Company.*

Circle number (4) on reply card.

Compressed Air and Gas Trap. New type of compressed air and gas trap has been developed by Hankison. The "Mag-Pneu-Power" Trap discharges condensate from compressed air or gas lines by a combination of magnetic, pneumatic, and automatic action.

Operation of the trap is simple. As the condensate in the trap rises, the float is held firmly in place by a magnet mounted on the pivot arm. When the force build-up of the float overcomes the magnetic attraction, the float snaps open the pilot valve. When sufficient condensate has been discharged, the float drops. *Hankison Corporation.*

Circle number (5) on reply card.

Safety Switch and Pressure Gage. High and low pressure contacts on the one instrument is used to shut down equipment or sound an alarm, flash lights or operate other types of controls on pipeline pumps, water flood projects, gas compressor stations or where either high or low pressures could cause damage to unattended equipment. *Frank W. Murphy, Manufacturing, Inc.*

Circle number (6) on reply card.

Wire-Line Trucks in Service. A fleet of new wire-line service trucks, designated 300-H, are reported to exceed the operating ability and safety of similar units available in the oil patch. Designed to travel over the most rugged terrain, units include

electronic and mechanical instruments and equipment which have not previously been combined in one wire-line service truck.

Safety has been stressed in that (1) The BJ safety firing circuit is so designed that a red light flashes and a horn blows for a time before the gun can be fired, assuring ample warning to all personnel. (2) Inter-communication system between the operator and the floor crew eliminates the hazard of mistaken signs. (3) A finger-tip controlled brake will not self-release under line loads. (4) The BJ calibrated sheave measuring system is mounted inside the truck to prevent rough handling. (5) Fire hazard has been greatly reduced by eliminating the need for 110-v current at the wellhead. The first unit is assigned to Farmington, New Mexico. *BJ Service, Inc.*

Circle number (7) on reply card.

Blowout Preventer Accumulators. New Payne Non-Separator-type Accumulator units are of all-steel construction—in 20-gal size—with service pressure of 2000 psi. Accumulators are unique in that no rubber bladders, diaphragms, or piston packing are used. Accumulator is comprised of only 3 parts, all of which are easily and quickly replacable in the field. Units are used in multiples of 1 to 6 for use with Payne blowout preventer operating units. *Payne Manufacturing Company, Inc.*

Circle number (8) on reply card.

Motor. Designed for application throughout the petroleum industry in all situations with inherent corrosive conditions is the Reliance corrosion-proof a-c motor. An outstanding feature of the motor is exclusive Reliance "metermatic" lubrication that regulates the flow of grease to the bearings as needed. Rotors are dynamically balanced and annealed for increased magnetic efficiency, frames are constructed of solid cast-iron, and internal components are protected by the Zanderoll insulation process for resistance to acids, moisture and oils. *Reliance Electric and Engineering Co.*

Circle number (9) on reply card.

Tiny Battery. General Electric is in pilot production on a tiny new power source, 1/35 the size of a flashlight battery, but with 60 times the voltage. Designed for highly-specialized uses requiring small size, long life, and high voltage output, 1-in.-long battery has projected life of over 20 years.

Company believes it to be applicable to remote warning devices, deep well survey equipment, and electronic instruments. New battery produces 95 v, weighs 1/5 ounce and less than 1/3 in. in diameter. Research and development was carried out by Dr. W. J. van der Grinten of the company's electronics laboratory. *General Electric Company.*

Circle number (10) on reply card.

Plug-in Static Control Unit. Designed to broaden the scope of static switching to include protective functions such as undervoltage protection, undervoltage release, switch volts protection, overvoltage limit, fault indication, and others is a new unit by General Electric.

The addition of this unit brings the number to eight individual elements available for use by General Electric engineers in designing low-power static switching systems for process control in virtually every industry. The new unit provides protective functions by means of three electrically-isolated control windings—one of which is suitable for use in circuits up to 750 v d-c — on a magnetic amplifier unit. *General Electric Industry Control Department.*

Circle number (11) on reply card.

Fluid Level. Fluid level measuring instrument, known as the Fluid Log, features accuracy, simplicity of operation, portability and low cost. It is entirely nonelectrical, and operates by measuring the time required for a pressure pulse to travel down the well annulus to the top of the fluid and be reflected back to the surface. A means of calibrating the speed of sound for the gas and pressure conditions of each individual well provides maximum accuracy.

Operation, including calibration, measurement and determination of fluid depth may be performed by a field man in less than 5 min on any well having pressures from a few ounces to 250 psi. Complete unit weighs less than 30 lb. *Nu-Tec Manufacturing Company.*

Circle number (12) on reply card.

NEW Literature

For more information on items described here in brief, use the handy reply card and circle the corresponding numbers

Basic Sediment & Water Monitor. A 4-page, color brochure has been announced by Instruments, Inc., on Gulf Research and Development Company's BS&W Monitor for measuring and controlling the bs&w content of crude oil at automatic custody transfer installations. A photo, diagram, and charts describe the monitor, how it operates, and a typical installation. *Instruments, Inc.*

Circle number (13) on reply card.

Rigid PVC Plastic Pipe. An 8-page folder on Kraloy, rigid PVC plastic pipe, has been released by Kraloy Plastic Pipe. Technical data include tables, diagrams, and flow rate charts for the use of this pipe. *Kraloy Plastic Pipe Company, Inc., subsidiary of the Seamless Rubber Company.*

Circle number (14) on reply card.

Compressor Lubricants. Pydraul AC, a fire and explosion resistant fluid developed by Monsanto specifically as a lubricant for air compressors, is the subject of a technical bulletin. Use of the fire-resistant fluid in place of petroleum oil greatly reduces hazards of air compressor explosions and receiver fires, the bulletin states. *Monsanto Chemical Company, Organic Chemicals Division.*

Circle number (15) on reply card.

Flare Tube Fittings. Newly issued 52-page catalog presents full line of Triple-lok tube fittings, made in brass, steel, stainless steel, and aluminum; all shapes including new swivel nut type and straight threaded fittings with o-rings for new SAE straight thread boss. *Tube & Hose Fittings Division, Parker Appliance Company.*

Circle number (16) on reply card.

Horizontal Pressure Filters. Cochrane publication 6322 furnishes details on horizontal pressure filters. It describes operation, control, filter bed materials, design features, available accessories, etc. *Cochrane Corporation.*

Circle number (17) on reply card.

Machine Tools Catalog. Entire line of South Bend precision tools is illustrated and priced in a new 80-page catalog No. 5700. Equipment shown includes engine lathes, toolroom lathes, turret lathes, vertical spindle milling machines, bench shapers, drill presses and pedestal tool grinders. Attachments, tools, chucks and accessories for all South Bend machine tools are also listed. *South Bend Lathe Works.*

Circle number (18) on reply card.

Payne Catalog. A new 20-page photographically illustrated catalog, the Tenth Edition, covering the complete line of Payne blowout preventer operating units, accumulator units, control equipment, and general service and high-pressure plain-end plunger pumps, is available. Engineering data, installation, maintenance, and operation is covered, with complete parts and price lists. *Payne Manufacturing Company, Inc.*

Circle number (19) on reply card.

Detroit Diesel Power Units. Detroit Diesel's line of 2-cycle power units for oil fields is fully described and illustrated in a 16-page brochure. Covered are turbo-power models, diesel-electric sets, single and multiple-engine units from 60 to 762 hp. Also covered are torque converter models and marine propulsion units for craft servicing offshore operations. *Detroit Diesel Engine Division, General Motors Corporation.*

Circle number (20) on reply card.

Manual Makes Motor Selection Easy. New, 12-page, 2-color application guide that makes it easy to select electric motors for all popular applications is published by Century. Reader can select from tables the kind of equipment or machinery to be driven, then identify the character of the load, the speed of operation, starting and running torques, surrounding atmosphere, frame type, and speed to arrive at the right motor for his specific application. In a few moments, the reader knows the motor type he needs, dimensions, and other pertinent data. *Century Electric Company.*

Circle number (21) on reply card.

Cementing Aids. An 8-page catalog covering Pathfinder oil well tools is made available. The Pathfinder line includes specially designed hinged, rotatable, and close tolerance-type centralizers, as well as a grip collar and a unique tool for the removal of undesirable materials from the walls of wells to permit a better bonding of cement to the formation. *Oil Country Equipment Company, Inc.*

Circle number (22) on reply card.

Engine Catalog. Nordberg Power Chief Gas engines for oilfield service are described in a new 8-page bulletin published by Nordberg. These engines are built as 1 and 2-cylinder units and cover a range of 8 to 36 hp. Annotated views of the engine, a lubrication system diagram, parts views a cutaway view through a power cylinder and horsepower performance curves of each engine type are included. In addition, complete specifications, dimensions and shipping data for the engines are shown. *Nordberg Manufacturing Company.*

Circle number (23) on reply card.

Ventri-Line Close-coupled Industrial Pumps. Easy to use table for determining horsepower, capacity and head for vertical pumps makes this bulletin worth keeping. Also contains sectional views, material specifications, schematic application drawings, and photos of installations. *Layne & Bowler Pump Company.*

Circle number (24) on reply card.

Drillable Packer. Guiberson Corporation announces a 2 color bulletin on Permanent Completion Type A Drillable Packer. Bulletin gives illustrations and descriptions of the packer and accessories and detailed outlines of running and setting procedures along with surface setting stroke tables for both 2 and 2½-in. tubing. *The Guiberson Corporation.*

Circle number (25) on reply card.

Oil Tool Catalog. A 12-page illustrated brochure shows the offshore and regular drilling and oil tool specialties of Joe Stine. Specialized offshore equipment, including custom-designed jacks for mobile barges and rig skidding jacks, and sections devoted to big rig-up for export, special shop fabrications, and the mud system items are included. *Joe Stine, Inc.*

Circle number (26) on reply card.

Bulk Handling. Catalog covering the complete line of bulk handling equipment and correlated equipment, with special fabrications in that line, is published. Standard bulk cement, mud, and sandfrac plants are shown, as well as bulk commodity trailers and bulk truck units. Dry mud and cement storage bins and feeders are included with special items in the drilling field. *Rig Engineers and Fabricators Co., Inc.*

Circle number (27) on reply card.

Thermometers and Hydrometers. A new 24-page booklet featuring the latest information on thermometers and hydrometers is published by Central Scientific. Booklet contains a complete listing of ASTM, general and specific purpose thermometers and hydrometers for measurements of temperature and specific gravity. ASTM thermometers are listed by number and test. *Central Scientific Company.*

Circle number (28) on reply card.

Comprehensive Valve Lubricant Bulletin. New 12-page version of Rockwell's comprehensive bulletin "Lubricants for Rockwell-Nordstrom Valves" provides more detailed lubricant selection date, including information about 80 new lubricants. Leading lubricants are described in more detail than in previous bulletins. *Meter and Valve Division, Rockwell Manufacturing Company.*

Circle number (29) on reply card.

Synthetic Rubber Brochure. DuPont has published a 15-page brochure covering Neoprene and Hypalon elastomers. Brochure includes data covering applications, chemical resistance and properties of the various synthetic rubber compounds marketed under the DuPont trade mark. *E. I. du Pont de Nemours & Company, Inc.*

Circle number (30) on reply card.

Simplifies Selection of Coatings. More than a catalog, the new Rust-Oleum 1957 Coatings Manual is a treatise highlighting the prevention of rust on nearly all types of metal. Incorporating 35 years' experience in rust prevention, it features the results of over 2 years of intensive research by Rust-Oleum engineers and local technicians in areas where conditions of excessive moisture, salt spray, fumes, gases and weather, are severe.

This comprehensive, 32-page full-color manual provides a practical, workable guide for all buyers and users of protective coatings. It contains information and recommendations which enable the user to determine quickly and accurately the specific coating needed. *Rust-Oleum Corporation.*

Circle number (31) on reply card.

Year After Year...

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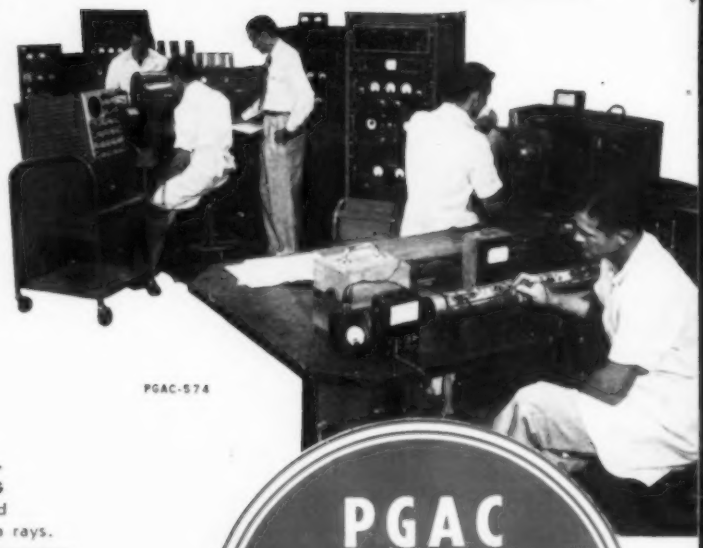

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... still the world's most powerful gun— and still used without a premium charge.

1948 — **Developed JET SHOT PERFORATING TECHNIQUES**
... pioneered most effective field results— accomplished jet acceptance in oil fields.

1949 — **Developed NEW GAMMA RAY INSTRUMENTS**
... with quantitative calibration for more precise radioactive logging of formations.

1950 — **Developed SIMULTANEOUS RADIATION LOGGING**
... utilizing a pure neutron/neutron to avoid faulty phenomena of detrimental gamma rays.

1951 — **Developed FOUR-RESISTIVITY-CURVE ELECTRICAL LOG**
... employing an S. P. curve of greater detail for more accurate analysis of formations.

1952 — **Developed JUMBO SIDEWALL CORE SAMPLING**
... with larger cores more precisely located through the S. P. curve of electrical log.

1953 — **Developed QUANTITATIVE EVALUATION OF POROSITY**
... through neutron/neutron log calibration— with accuracy never before obtained.

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Complimented by Imitation but
NEVER EQUALLED
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1954 — **Developed "MIGHTY MOUSE"® — CHAMP OF THE MIDGET GUNS**
... expendable 1¾" jet perforator of 50% greater power for permanent-type well completions.

Developed ABSOLUTE CALIBRATION STANDARD for RADIATION SOURCE
... producing a Simultaneous Radiation Log of unequalled repeatability regardless of radiation source strength.

1955 — **Developed SIMULTANEOUS 4-RESISTIVITY CURVE ELECTRICAL LOG**
... simultaneously recording 4 resistivity curves, giving more complete formation evaluation than ever.

1956 — **Developed NEW HIGH-PRECISION MICRO-CALIPER SURVEY**
... for simultaneously logging resistivity of materials on walls of hole and recording hole-diameters.

Developed SUPER "MIGHTY MOUSE"® TUBING PERFORATORS
... in 1¾" and 2⅛" O.D. sizes, both the world's most powerful fixed-diameter expendable tubing guns.

PERFORATING GUNS ATLAS CORPORATION

Houston, Texas Telephone REpublic 4-1651
General Offices and Main Plant: 7730 Scott Street — Sales Office: Melrose Building

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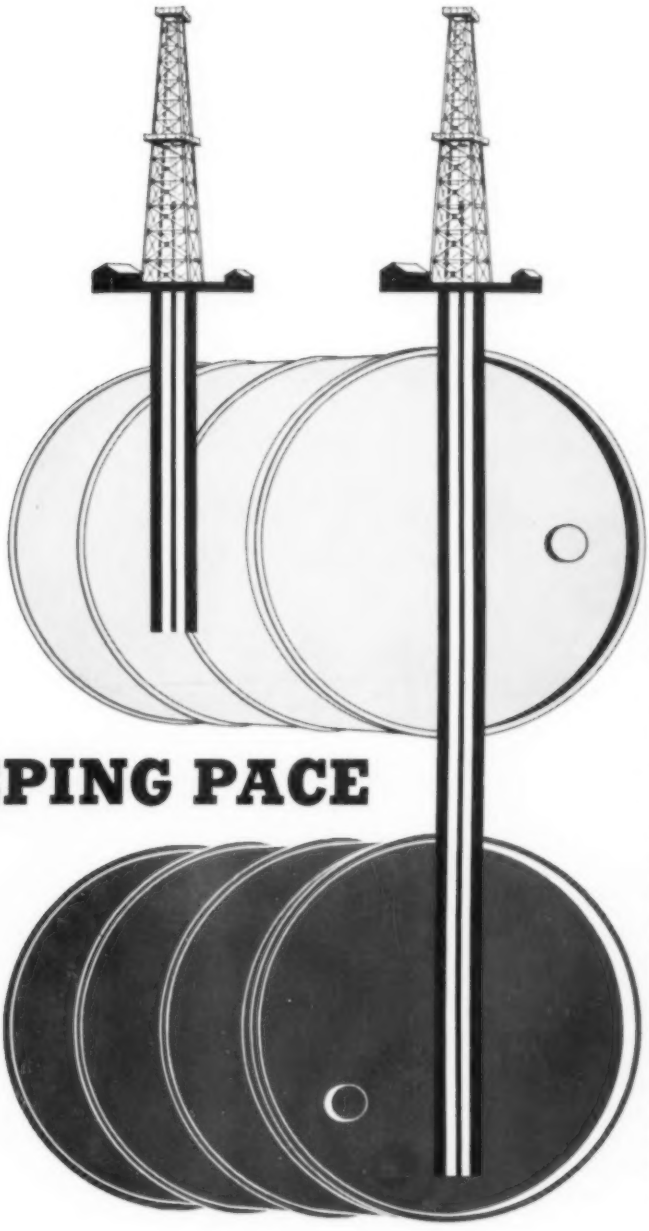

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Drills were chewing their way down for about 2000 feet in the search for oil in 1916. Today's drilling depth is more than double that.

The change in drilling that forty years has brought well symbolizes many advances in the petroleum and chemical industries. Engineers have dug more deeply into the secrets of nature, too . . . have designed plants and processes to wrest new products and services from petroleum, ores and elements.

We mentioned 1916 because that is the year Sun Ship was founded. It has long served the swift-growing needs of petroleum and chemical industries. Year by year, the engineering skill and facilities of the great Sun Ship plant have proven their ability to meet the demands for plant and equipment keyed to the swift pace of progress in these and other important fields. Sun Ship keeps pace with progress.

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Planning to Retube a Butane Condenser?

The opportunity to boost heat duty of butane condensers —without the expense of investing in new equipment—is available to processing engineers *right now!*

The secret? Retube with Wolverine Trufin* Type S/T—the only integral finned condenser tube for shell and tube heat exchangers.

By replacing prime surface tube with Trufin Type S/T, you can obtain as much as 2½ times greater shell side surface area in existing equipment. Result: increased heat duty from present units.

Trufin Type S/T is mechanically interchangeable with plain tube of the same size. It can be rolled or brazed into headers by conventional methods. All the mechanical features of conventional types of heat exchangers as well as the custom designs of individual fabricators can be retained.

Trufin in copper, copper-base alloys, aluminum and electric-welded steel is furnished in a wide range of sizes. It's available with four different kinds of end finishing: both ends finned, both plain, both stripped, or one end plain and the other stripped. You'll save if you specify Trufin when retubing is necessary. *Call Wolverine right now!* And write for your copy of Wolverine's Process Flowsheet Book.

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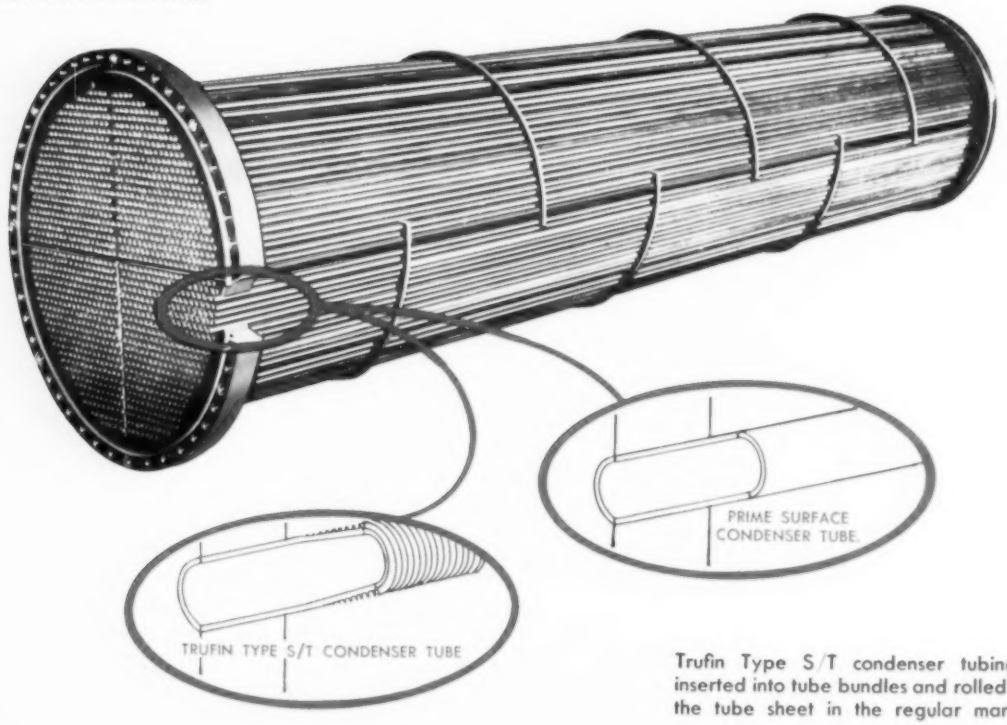


Trufin Type S/T condenser tubing is inserted into tube bundles and rolled into the tube sheet in the regular manner.

FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD

New Projects in refining gas processing petrochemicals

The Pacific Northwest is to have another refinery. The Texas Company has let contracts to Bechtel Corporation for process unit construction and Chicago Bridge & Iron Company for tankage for a 40,000 BPD refinery near Anacortes, Washington. To be known as the Puget Sound Works, the $60 million plant will provide prime fuel products to Northwestern markets. Last month RE reported that Richfield Oil Corporation had taken options on 1000 acres as a potential refinery site on an arm of Puget Sound, about 15 miles from Everett, Washington.

Calcasieu Chemical Corporation is planning an eight million gallon per year ethylene glycol plant to be built at Lake Charles, Louisiana. The plant will be operated by Petroleum Chemicals, Inc. and will be adjacent to PCI's 100,000 ton per year ethylene plant that is now under construction. Using a Shell Development Company Process, the $11 million plant will be built by The Lummus Company.

Celanese Corporation of America is adding facilities at its Pampa, Texas, plant for the production of 15 million pounds per year of acrylate esters. Celanese will be putting its polyolefin resin plant at Houston, Texas, onstream within the month.

Gulf Oil Corporation is picking up the first of six options on land for a potential refinery site near Charleston, South Carolina. While Gulf will presumably pick up the remaining options, no definite plans are announced, pending results of further studies into water availability, rail, plant and highway service.

Shell Oil Company is adding a 200,000 lb boiler to provide additional steam at the Wilmington-Dominguez refinery. The unit will be fired with carbon monoxide-rich flue gas from the refinery's catalytic cracking unit. The steam will be used for a catalytic reformer now under construction and for meeting requirements of Shell Chemical's expansion at an adjacent plant.

Imperial Oil Limited, Jersey Standard's Canadian affiliate, is considering a $17 million rebuilding and expansion program at its Calgary refinery. Current plans call for doubling the capacity of the 9200 BPD plant. Imperial has taken options on 260 acres of land owned by the city of Calgary adjacent to the present refinery. Imperial just recently rebuilt its Halifax, Nova Scotia, refinery from scratch.

Creole Petroleum Corporation has awarded Foster Wheeler Corporation a contract for construction of a 14,500 BPD Hydrofiner at the Amuay Bay, Venezuela, refinery. The $3 million plant will be used to upgrade furnace and diesel oils, using hydrogen from a nearby fluid hydroformer. Completion is scheduled for February, 1958.

Continental Oil Company will build a $1,750,000 natural gasoline plant in the Short Junction oil field south of Oklahoma City, Oklahoma. Tuloma Builders, Inc. has the construction contract for the plant, which will have a capacity of 60 million cubic feet daily. The first gasoline plant in the Short Junction field, the plant will produce butane and propane in addition to natural gasoline.

General Electric Company is going into large-scale production of irradiated polyethylene, will increase the capacity of its Pittsfield, Massachusetts, plant from 300,000 to 1,600,000 lb per year. Design will be such that the plant could be doubled in the future.

A $5 million anhydrous ammonia plant will be built by the Ammonia Chemical Corporation near Huron, California. The plant will be financed by Monterey Oil Company, according to reports.

Fifty tons per day of sulfur will be recovered by a gas treating plant to be built at American Oil Company's Yorktown, Virginia, refinery by the Fluor Corporation, Ltd. Recovered sulfur will be kept in liquid form for shipment in tank cars.

A 65,000 BPD refinery is slated for construction near Istanbul, Turkey. Costing about $48 million, ownership is divided between Socony (37 percent), Caltex (34 percent), Shell (18 percent), and British Petroleum (11 percent). There is only one refinery in Turkey at this time, a 7000 BPD government-owned plant.

Purfina Italiana and the Italian Government are going to build a 60,000 BPD refinery north of Rome. It will replace an 8000 BPD refinery that is owned by the Belgian Petrofina affiliate. A joint operating company, Raffineria di Roma, has been organized by Purfina Italiana and ANIC, a subsidiary of Italy's ENI oil monopoly. Another Petrofina affiliate has received approval from Portugal for construction of a 20,000 BPD refinery at Luanda, Angola, a Portuguese colony on the West African coast.

Construction Notes in Brief . . .

Construction Contractor	Engineering and Design Company	Location	Type of Plant or Unit	Rated Capacity	Cost	Scheduled for Completion
			British American Oil Company, Ltd.			
Lummus Co. of Canada	Atlantic Refining Co.	Edmonton, Alberta, Canada	Catalytic Reformer	4000 BPD	—	Late 1957
			Esso Standard Refinery S. A.			
Badger-Comprino N. V.	Same & Esso Research	Antwerp, Bulgium	Hydrofiner	6000 BPD	—	Early 1958
			Powerformer	5600 BPD	—	Early 1958
			Humble Oil & Refining Company			
Badger Mfg. Co.	Badger & UOP	Baytown, Texas	Benzene Recovery	24 MM gal/yr	—	Late 1958
			Petroleum Chemicals, Inc.			
Foster Wheeler Corp.	Same & Esso Research	Lake Charles, La.	Butyl Rubber	30,000 T/yr	$17,000,000	Late 1958
			Skelly Oil Company			
Skelly Engineering	Same & Phillips	El Dorado, Kansas	HF Alkylation	3-4000 BPD	—	Early 1958

ETHYL STUDY ANALYZES INDUSTRY OCTANE POTENTIAL TO 1960

New report can help in your future refining plans

by **C. J. WOLF**, Ethyl Corporation Refinery Technologist

Ethyl Corporation has undertaken this study to evaluate the effects of present and future refinery processes on the antiknock quality of the motor-gasoline pool in the United States.

The octane potential of the United States refining industry from 1955 to 1960 has been analyzed for the United States as a whole and, separately, for the various regions—East, Midwest, Gulf, Rocky Mountain, and West Coast. The effects of present and future refinery processes in general, and the catalytic reforming process in particular, have been the primary variables evaluated.

Secondarily, changes in crude type, the ratio of domestic-to-foreign crude run, and the composition and disposition of those products from petroleum that influence the quality and yield of gasoline have also been taken into account.

Influence of refining techniques

ETHYL studies indicate that the octane number of the total motor-gasoline pool in the United States increased by 0.9 Research octane number (RON) and by 0.8 Motor octane number (MON) from the fall of 1955 to the fall of 1956.

During this period, the portion of the U.S. refining industry utilizing catalytic reforming increased from 66 to 81 per cent (based on projected crude-running capacity). Total catalytic-reforming capacity, including spare capacity, increased from 10.6 per cent of crude run in 1955 to 12.9 in 1956.

Industry saturation of catalytic reforming in this country as a whole has been estimated at 16.0 per cent of crude run. This saturation is for virgin-naphtha feed only, and it is estimated that it will be reached in the fall of 1957.

Saturation of catalytic reforming is expected to take place by this time in all regions of the U.S. except in the Rocky Mountain region, where saturation is forecast for the fall of 1958.

The octane potential after the fall of 1957 will primarily be influenced by the severity of catalytic reforming, catalytic reforming of heavy thermal naphtha, aromatic extraction with raffinate recycle, and maximum use of alkylation for motor fuel after compliance with aviation-gasoline demand.

A summary of the catalytic-reforming growth in the United States is presented in the table below.

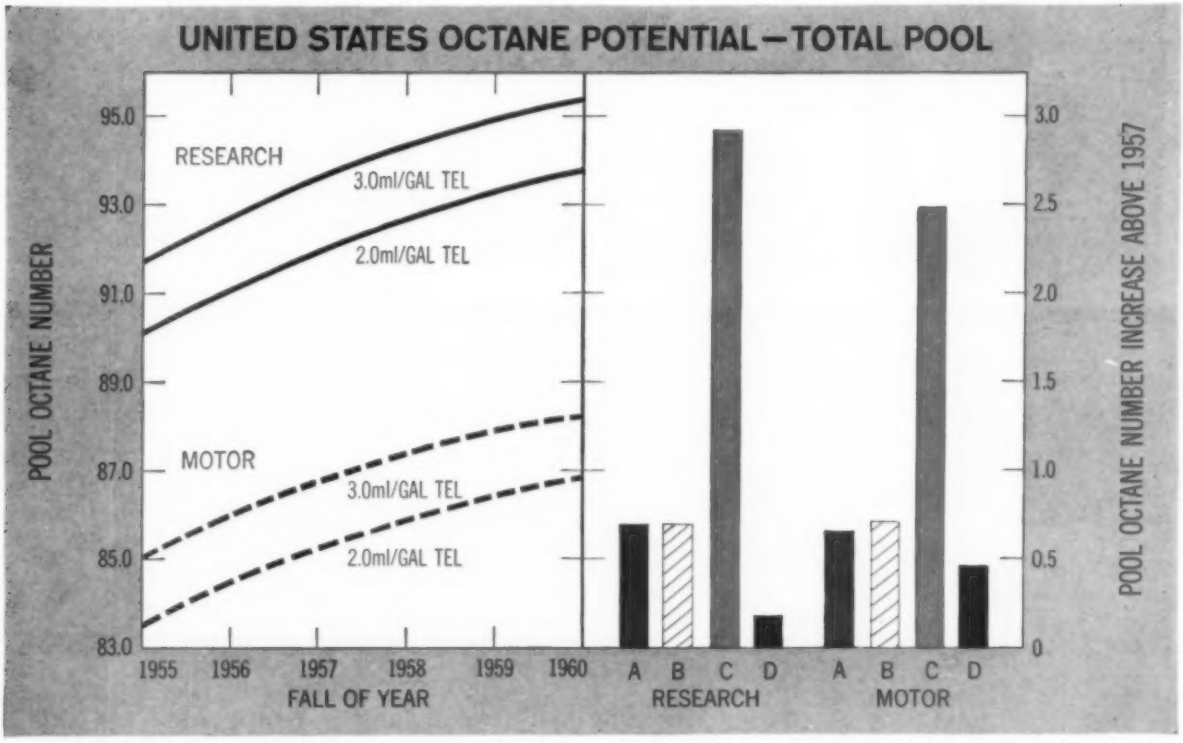
The effects of the growth or decline of refinery processes other than catalytic reforming during the 1955-1960 period have also been evaluated in this study. Growth is expected in catalytic cracking, catalytic polymerization, and alkylation in terms of percentage of crude run, during this period. In the same terms, decline is expected in thermal operations—visbreaking, coking, and thermal cracking.

CATALYTIC REFORMING

Per Cent of Crude Run

Fall of Year	1955	1956	1957
East	9.4	11.7	17.0
Midwest	11.0	13.1	16.9
Gulf	10.8	13.7	15.1
Rocky Mountain	1.9	7.2	11.9
West Coast	12.7	13.7	15.9
Total U. S.	**10.6**	**12.9**	**16.0**

FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD



The weighted regional-pool octane number potentials of total U.S. pool gasoline are shown from 1955 to 1960. The maximum octane increases obtainable from: **A.** increased reforming severity, **B.** reforming heavy thermal naphtha, **C.** aromatic extraction and reforming raffinate from straight run charge, and **D.** maximum alkylation are shown for the total U. S. gasoline pool. The weighted proportions of these refinery processes in use after 1957 were calculated from projected refinery economics.

Thermal reforming, with the exception of that planned for use in conjunction with catalytic reforming, has been considered to be non-existent when saturation of catalytic reforming of virgin-naphtha is achieved in 1957.

Increases after 1957

AFTER 1957, the maximum octane increase obtainable by more severe catalytic reforming, use of reforming capacity for heavy thermal-naphtha charge, aromatic extraction and raffinate recycle, and maximum alkylation will be about 4.6 RON and 4.2 MON for the total United States.

Depending on the region, this maximum potential octane increase can range from 4.2 to 5.2 RON and from 3.8 to 5.0 MON. The amount of this maximum potential octane increase that is actually employed by 1960 will vary from region to region.

Use of the above-cited refinery processes by 1960 could increase antiknock value of the total 1957 United States pool by about 1.7 RON.

The costs of octane improvement and local area conditions will dictate relative use of these more severe refinery operations.

In general, it is felt that increasing reforming severity to average a yield of about 80 per cent debutanized reformate will be almost universally employed throughout the industry by 1960.

The use of aromatic extraction and raffinate recycle and of catalytic-reforming capacity for heavy thermal-naphtha charge will be practiced by only one-third of the industry in 1960. It is believed that use of these processes will vary between 0 and 40 per cent, depending on the region.

Maximum alkylation above and beyond that required for aviation gasoline will be practiced by about 20 per cent of the industry as a whole, and in the various regions, with the exception of the Rocky Mountain area.

HOW ETHYL RESEARCH CAN HELP YOU

To assist refiners in obtaining the most economical routes to high-octane fuels, Ethyl Research maintains a close watch on trends in refinery processing. Recent studies of crude sources, processing and product yields provide a realistic evaluation of the octane potentialities of motor gasolines. The major findings are summarized for you here. A complete report entitled "U.S. Refining Octane Potential 1955-1960" is available through your Ethyl Representative.

ETHYL CORPORATION
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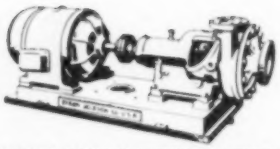

FIGURE 1025-1125 PROCESS PUMPS

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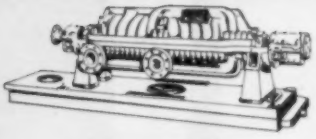
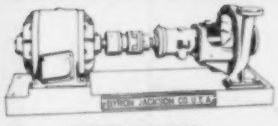


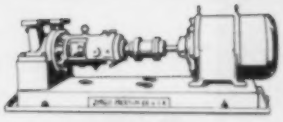
MULTIPLEX PUMPS

Recommended for boiler feed, debarking and all classes of medium-to-high pressure and temperature service. Easy inspection or cleaning without disturbing piping, bearings or driver.



CHEMICAL PUMPS

Specially engineered to handle corrosive liquids. Fitted with BJ Mechanical Seal with all major parts of seal isolated from pumped liquid. Positive protection against leakage to bearings or contamination of pumped liquid.



SM PROCESS PUMPS

For pumping fluids over a wide range of pressures and for temperatures up to 800° F. Ideal for pumping hot or cold liquids near their vapor pressure. Capacities to 4500 gpm and heads to 1900 ft.

VERTICAL CIRCULATING PUMPS

Single or multi-stage. For pumping medium to high capacities of water. Capacities to 50,000 gpm. Saves space, simplifies piping. For dewatering, drainage, river intake, circulating and sump services.

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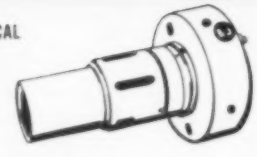
This general purpose pump features a BJ mechanical seal as a functional part of its design. It is built for continuous duty and temperatures to 400°F. Easily dismantled and reassembled without disturbing suction or discharge connections. Construction materials to suit application. Sizes: 1½ thru 6" suction, 1 thru 4" discharge. Capacities to 1500 gpm. Heads to 700 ft.

MECHANICAL SEALS



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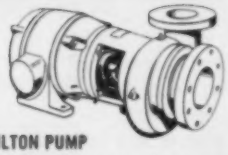

BILTON PUMP

A general-purpose, close-coupled pump and motor unit. Mounts in any position with no rigid base needed. Especially useful where space is limited. Available with explosion-proof motor. One-third to sixty hp. Capacities to 2000 gpm and heads to 475 ft.

TYPE VMT PUMP

May be designed for pumping liquids from sub-zero to 750° F.—corrosive or non-corrosive—where NPSH is limited. Capacities to 9000 gpm and heads to 575 ft. Smaller standardized (VLT) models also available in capacities to 240 gpm.

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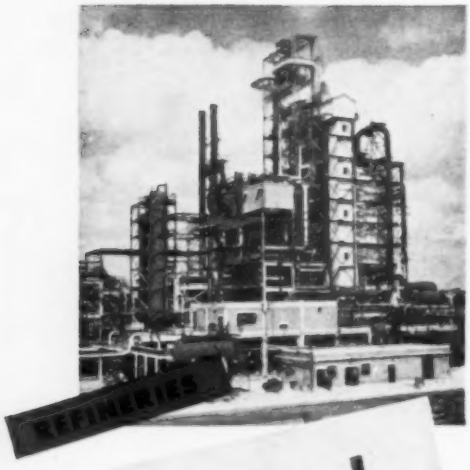

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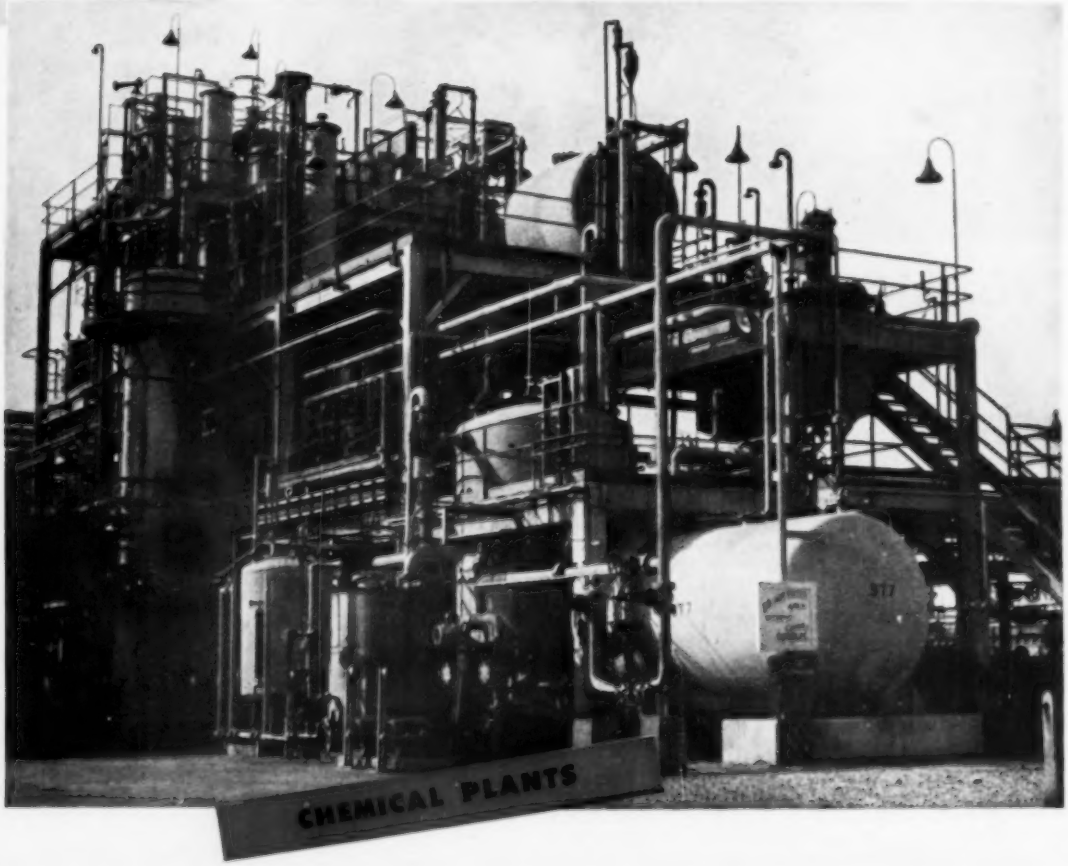

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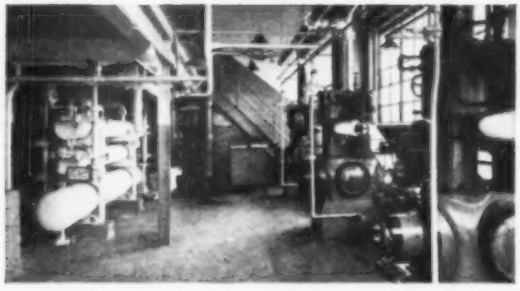

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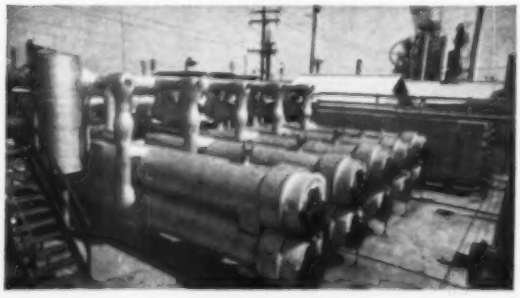

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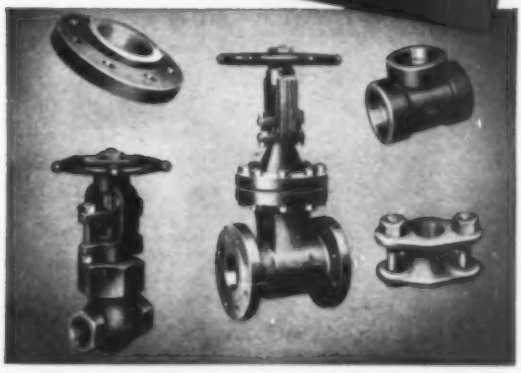

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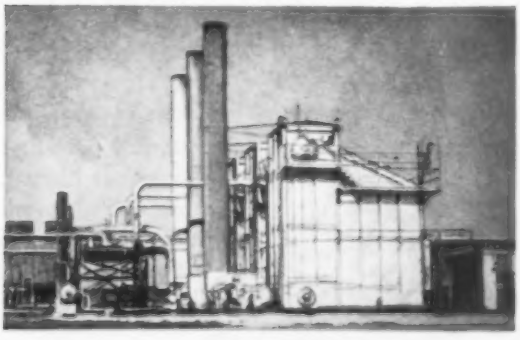

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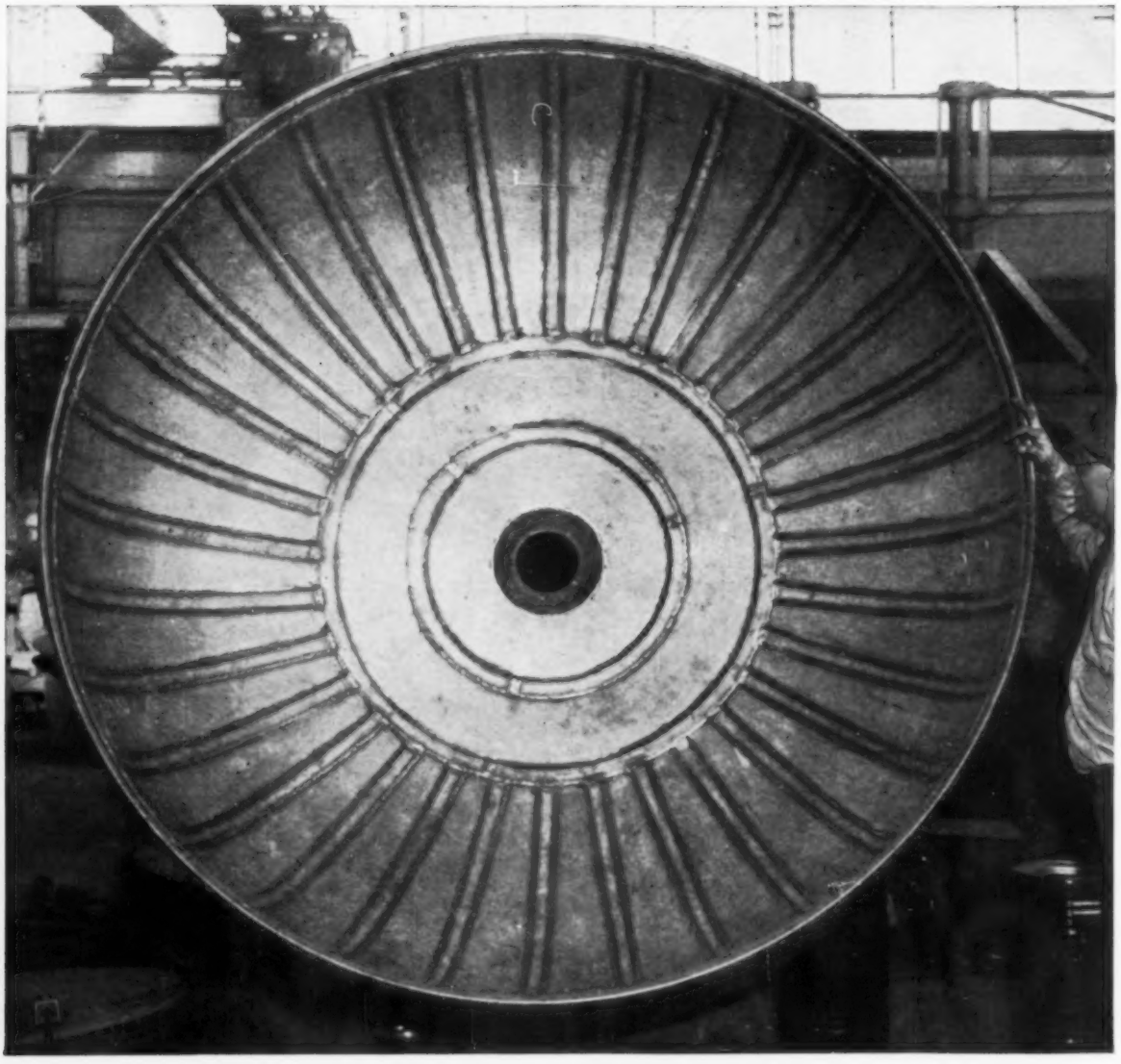

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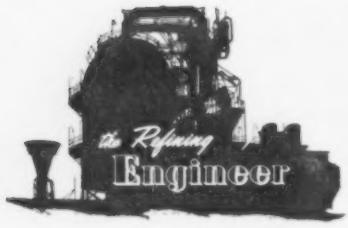


Standard of California uses engineers to good advantage in purchase inspection and expediting. And, the engineer receives valuable training for management positions

The engineer in purchase inspection . . . watching measurement of heat exchanger tubes.

P 944.1

Engineers in

John W. Parks
Standard Oil Company of California, Western Operations, Inc.

THE programmed use of engineers in the purchase and stores department was initiated in 1943. After a period of assimilation when organization and procedures were developed, the engineers gave their assistance in a steadily expanding application of these principles. It is generally recognized that the great diversification of problems in purchasing for an oil company requires a group made up of various talents such as business administrators, accountants, engineers, and attorneys; and occasionally others to supplement the buying organization.

Engineers were actually involved in purchasing long before 1943. Engineers in the operating departments were used as inspectors and expediters out in the suppliers' plants. Later, they were incorporated as a separate group in what was called the materials department, which also included materials engineers, a testing laboratory, and purchasing. The materials department was discontinued in 1933, and the inspectors and the materials engineers joined the engineering department, but continued to do inspecting and expediting in the suppliers' plants. In 1942 a careful organization analysis was made. This resulted in the moving of the inspection group to the purchase and stores department in 1943, since it was concluded that their services were more related to purchasing than to engineering.

During inspection and expediting in suppliers' plants, an engineer must necessarily negotiate with the supplier in many ways. Cost responsibility must be established for unanticipated conditions. More detailed inspection methods are frequently required when fabricating difficulties must be appraised to devise corrective steps. This is costly to the supplier, and an agreement must be reached on whether the customer or the supplier should rightfully bear the expense. Such negotiation, of course, is closely related to buying.

General Principles

As mentioned before, oil-business buying is rapidly becoming more technical. Deeper wells, wide variations in processing temperatures and pressures, extremes of all kinds in petrochemical plants, etc., bring up varied technical problems. Of course, design and any revisions found necessary during procurement are decided on with the counsel of the design and research organizations. However, with these expanded activities, the purchase and stores department must grow in stature to properly evaluate problems and situations as they arise, so that purchase and stores department personnel will handle those questions and problems which are truly a part of purchasing, inspection, or expediting and will not bother technical groups with routine matters.

Buying for the oil industry is rapidly becoming more technical, creating a demand for technical assistance to buyers. This article describes the many contributions that can be made by engineers in purchasing functions, shows that they can work efficiently and harmoniously with professional buyers.

As an example of how engineers function in this regard, experience in processing indicated that a need existed for stainless-steel castings which was different from any commercial specification. Purchase and stores department engineers visited foundries and discussed the practical applications of the specification with the proper officials; all comments and suggestions were organized and presented to a committee. An agreement was reached on a revised version of the proposal. Again the sources were canvassed. Two years later—after four such cycles—a good commercial specification was issued which has been in use for eight years without a revision.

First presented to the Petroleum Industry Buyer's Group during the annual API meeting in Chicago, November 13, 1956. Parks has made a special adaption of his paper for THE REFINING ENGINEER.

. . . checking X-ray film at marked location on a pressure vessel shell.

. . . measuring tilt of flange on a pressure vessel.

Purchasing Department

Plant visits are important. When rating the sources for common repetitive items, inspectors' recommendations and the usual business considerations suffice. Current performance records maintain up-to-date evaluations. For unusual or critical fabrication jobs, the purchase and stores department engineer reviews the requirements with the design or process engineers, and then visits the likely sources. If a review of the plant facilities confirms the engineer's opinion on the adequacy of the supplier's facilities, the proposed job is explained to the supplier's officials in order to appraise their staff and their willingness to tackle the assignment.

The purchasing department also determines the steps that must be taken to assure quality and delivery. Special jobs necessitate preplanning of inspection and delivery effort before bids can be invited. The supplier then bids with complete knowledge of the extreme quality control measures which will be applied and/or the importance of delivery and the expediting which will be applied to assure it. The purchase and stores department engineers lend their assistance throughout these negotiations and meet with the buyer and supplier to negotiate the final details of the contract or order. The order is then accepted by the supplier with complete understanding of the requirements.

Answering questions. The purchasing department will answer bidders' and suppliers' questions whenever possible, so that operating departments are not contacted on unessential questions or irrelevant suggestions. Thus, the engineer in the purchasing department supplements the talents of the buying group with technical education, experience, and special training. He appraises sources, including the skill and aptitude of personnel as well as the physical plant and workmanship. He establishes inspection and expediting procedures. By answering buyers' general technical questions and by reviewing their suggestions, he can screen them so that only pertinent matter is referred to operating department engineers.

Engineering judgment. Purchasing department personnel must use good judgment in order to avoid attempts to do work which would involve engineering aspects but would actually be beyond their scope. For example, an engineer inspecting some cast-steel pumps was also expediting. When inspecting the castings, he noticed that the foundry had been generous and had used a little nickel in the chemistry. The inspector thought it was a good feature, noted its use in his next current progress report, and attached the certified analysis to the report. The metallurgical service group to the process engineers immediately rejected the castings because they realized that nickel, which would enter the stream by corrosion, was poison to the particular process.

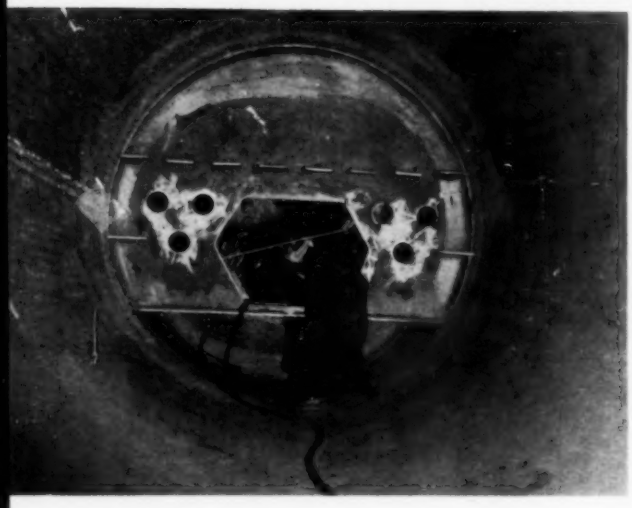
The inspector should have questioned the analysis when it was established that it was different from the ordered analysis. However, his general knowledge of metallurgy had led him

The Author

John W. Parks is presently supervisor of inspection, expediting and quality control, purchase and stores department, Western Operations, Inc., Standard Oil Company of California. He has held this position since 1946. He was chief inspector for purchase and stores department, 1943-1946, and held a similar position in the materials division of the engineering department of Standard for eight years. He held various positions in engineering, inspection, and operating at Standard's Richmond refinery, 1929 to 1935. He is a civil engineering graduate of the University of California, Berkeley. He is a member of The American Society For Metals and The American Welding Society.

The engineer in purchase inspection . . .

. . . are these trays ok?



. . . a dye will show up checks in the weld metal.

to believe that he was accepting a superior steel. The strong delivery aspect, no doubt, was a contributing factor in this failure because it made the inspector possibly overanxious to move things along. As it was, the pump cases were almost completely machined before work was stopped. Such special cases are now brought out in requisitions when it is necessary to caution suppliers against their good intentions and to flag them for buyers and inspectors.

Functions

The core of our engineers' work currently is in inspection and expediting. Purchase orders requiring these actions are turned over to the inspection group where they are processed to completion. Any change in the order found necessary during inspection or expediting is referred to the buyer for negotiation and formal change order. In the line organization, materials-engineering service of all kinds is rendered incidentally. The staff supervisor of inspection, expediting, and quality control, on the other hand, spends only about 10 to 15 per cent of his time on routine matters and devotes the remainder to general service.

Other contributions. Engineers also contribute much by helping purchasing department groups in their contribution to standardization, specifications, and recommended practices. The engineer quickly grasps the technical purposes and application of operating departments' proposals. With his engineering ability and his wide purchasing experience in many different types of product and fabricating plants, he is able to correlate practical aspects of procurement, trade relations, etc. with the technical goals in preparing standards, specifications, etc. Engineers in the purchase and stores department serve on company-wide committees established for this purpose. After assisting in preparing drafts, they secure comments and suggestions of probable sources. These sources are screened so that final issues of standards and specifications are assured of good practical application.

Standardization. Part of the engineers' inspection and expediting responsibility is to be aware of commercial standard items that can be used to replace the company's standard designs. Each is provided with a set of company standard drawing books and each new issue is routed to all members before it is inserted in the book. Whenever a supplier makes an article of his own design for regular sales and this article serves the purpose of an item in the company's standards, a cost analysis is made to determine whether the new article or the company item would be more economical.

Company engineers also add technical and inspection experience to the buying function to ferret out the best sources for noncommercial, special items, such as castings in unusual alloys, difficult fabrication, and machine problems, etc. This frequently is concurrent with engineering designs which results in a workable initial requisition reaching the purchasing department group.

Assisting suppliers. When a desirable supplier is not in a position to readily supply the company's needs the purchase and stores department engineer can be of assistance. By reviewing the supplier's facilities and coupling this with his knowledge of company requirements, he can determine modifications or new products which the supplier can make. He can also assist a supplier in meeting our specifications. For this he can, if necessary, draw on service available in the engineering department, materials laboratories, and research groups. Having been associated formerly with one or more of these groups, or having worked with them peviously on technical inspection problems, engineers usually know which expert to ask for help.

Proper processing of field complaints on defective material and equipment is another field for engineers. If routine handling does not get results promptly, the buyer refers the matter to the chief inspector in his particular office. This engineer secures the technical facts, then visits the source and explains the difficulties. Most often, delays in correcting difficulties are due to misunderstandings. When an engineer explains the field troubles to a shop production man, there is usually no further difference of opinion and a plan is worked out to preclude recurrence of field trouble. Examples of trouble might be improper threading of flanges, surface finish in machine work, revision of design to reduce failures from stresses at notches, etc.

We had, for example, a situation in which embossed service-station signs were rejected early in a contract. Embossing of the large letters caused waves or curvature in the surrounding metal. When our engineer was contacted, only a few had been shipped but some 150 out of 1500 were formed. Discussion with the stamping people indicated that only a new metal die would solve the problem, at a cost of $18,000 and a delay of several weeks. This would have been a very serious problem for the sign maker and would disrupt our building program. Our inspector solved it by taking a few warped signs to a clever elderly craftsman whose business was fender repairing. He knew

. . . discussing pump flange facing with the manufacturer's test engineer.

. . . is this motor control panel manufactured to our specifications?

how and where to heat and chill the thin metal to remove bulges and bends. After experimenting on three or four signs, he took the job of straightening all as fast as needed, at a fraction of the cost of the new die. The order was completed on time at a profit to all concerned, and we erected beautiful signs.

In the warehouse. Technical men are important in storehouse functions. They perform more technical inspection upon receipt of material. While non-technical assistants do most routine work, the engineer reviews data to recognize trends and trouble signs. He then makes more thorough checks. For example, an engineer recently rechecked cracking unit tubes reported as rough or slightly pitted. He recognized the appearance as more than superficial trouble and had some areas ground and etched. An unusual general cracked surface condition was revealed. In another case he correlated occasional rejections of a certain manufacturer's valves. When this impressed him as symptomatic, he arranged for the inspector in that manufacturing area to check at the plant. The inspector found the various alloy trim materials got into wrong bins because a checker did not understand the results of spot chemical tests he supposedly was trained to apply.

Reclamation activities require engineers to plan activities, layout and design shop areas and buildings and equip them with machinery. He also assists in establishing methods, tests, and standards for reclamation operations. For example, existing obsolete plants, pipelines, etc., must be reviewed. Thorough plans are required to economically dismantle, transport, sort, clean, and reclaim usable material and equipment. The engineer takes a strong part in these actions by appraising condition of material, estimating cost of reclaiming as compared to preparing it for best price as scrap. He also keeps up with national and company standards and applies them in reclamation shop standards. This results in production of reclaimed pipe, valves, fittings, etc. being placed in storehouse in a condition at least equal to modern new equipment.

The reclamation engineer also performs valuable service by making suggestions for revisions to new equipment. He recognizes failure points in machinery, valves, etc., and when a consistent type of failure is repeated he makes an analysis. He may suggest new materials, design changes, etc. He may also recommend operating practices to lengthen the life of equipment.

Organization and planning. Engineers in purchasing organizations after some years of experience, may be helpful in groups studying department wide organization and planning. For example, a team for reviewing activities of a group might consist of a buyer, an accountant and administrator and the engineer. In a purchase, stores, and reclamation department an engineer will recognize technical features of activities, both good and bad, which might not otherwise receive proper emphasis. For example, in reviewing a buyers' group an engineer will recognize the necessity for certain details insisted upon by an operating department while other members of the committee might not be aware of the need and therefore take much time to analyze it and question the activity.

The engineer also understands what information is required by sources to understand orders, follow-up inquiries, etc., and is able to analyze orders quickly in this respect. An engineer once solved a trouble spot in buying by recognizing one department's requisitions for machinery parts as impractical because they specified not only the chemical content and final physical properties but also the heat treating steps. By changing the specification to describe the final conditions required and the tests to be made to substantiate results without telling suppliers *how* to do their work, the time consuming troubles with these orders was eliminated.

Organization

The engineer may be trained for many positions in a purchasing organization, particularly when he begins in purchasing immediately after graduation. A graduate going directly into purchasing, however, will lack the broad experience necessary for the range of advice and counsel which is anticipated. For this reason, starting in 1943, the company moved the outside inspection force bodily from the engineering department to the purchase and stores department, and in 1946 fitted them into the staff-line organization.

The chief inspector was made supervisor of inspection, expediting, and quality control on the department manager's staff. He became responsible for overall procedures, expenditures, and advice and counsel to the line groups. A chief inspector was established in each of the two geographical divisions, each having four inspectors under him. Each member of the group had some years of refinery or field-engineering, inspection, and operating experience. A system was also established to make use of commercial inspection agencies in outlying areas and to provide men for peak requirements in work load. The buying groups are similarly or-

ganized in staff and line so that our individual engineers work beside and on the same organizational level with the individual staff and line buyers with whom they cooperate.

Qualifications for Inspectors

Job descriptions are established for each level. These include minimum qualifications which a man must possess in order to begin a job.

Line inspectors are in three categories: Trainee, Class B, and Class A. While technical college graduates are preferred, a man who has only two years of college often develops into an excellent inspector. Two years of college provides sufficient background in mathematics, chemistry, and physics for learning much of the work and establishes some habits of logical thinking and studying. However, prospects for ultimate advancement probably are not as great as they would be for a man with a college degree.

On-the-job training. It is best to start new men as refinery or oilfield equipment inspectors, or equivalents, in order to provide them with practical background before sending them into the suppliers' plants. The new men are provided with a set of inspection instructions supplemented by more detailed treatises on various subjects, such as welding, castings, nondestructive testing, steel fabrication, gaging practices, etc. Each man is assisted in learning these subjects thoroughly. They are also assisted in a reasonable manner to go on with their formal education if they desire it. A system is also used to inform each engineer when lessons are learned by experience or when good or unfortunate results are obtained by others. Furthermore, daily work is programmed with continually increasing responsibility being assigned to an individual, consistent with his ability to absorb. As opportunities arise, the engineers are given experience in buying. Specialization is avoided because individual preferences and abilities provide sufficient variety in the direction of specialization.

Rotational assignments. In addition to providing inspectors with reading matter on the experience of others, the company attempts to broaden them and refresh the experience of each inspector by temporary transfer during infrequent periods of low work load. They can be loaned to refinery-equipment inspection groups, to construction-materials handling, to the engineering department, etc. Within the company is a correlated plan for the exchange of personnel for such purposes. This involves the trading of men who are of approximately equal caliber for an appreciable period — six months to two years. In this way it is possible to give shop experience to a design engineer by using him as an inspector, while our inspector may replace a refinery-equipment inspector who, in turn, replaces the design engineer.

Promotion to higher responsibility. To advance to division chief inspector, the purchase and stores engineer must display appreciable planning and supervisory ability. He demonstrates these qualities by the manner in which he organizes and executes his own work and that of the assistants and trainees provided for him. His ability is also evident when he substitutes during the absences of his immediate superiors. Some business acumen and an ability to get along with people is also essential.

In order to go on to higher positions or to move into actual buying or analytical work in a purchasing organization, the engineer must become more agile in his approach to problems. His formal education teaches him to be coldly logical—a logic based on physical facts and technical assumptions. Purchasing puts him into much closer contact with people and it requires that he work more with intangibles, such as logic, tolerance, give-and-take, and human relations. These become his tools — equal to or possibly more important than his engineering tools, but neither substituting for the other.

Looking ahead. Future plans include trainee buyers with engineering degrees. The company plans to have these men spend some time with the inspection group. No emphasis is placed on any specific degree. There will be civil, chemical, electrical, mechanical, and metallurgical engineers. Engineers with a master's degree in business administration have advanced rapidly in the company. Young men who changed their college major to business administration after two years of engineering have also done well.

Conclusion

The company has found it quite logical in practice to have engineers as inspectors and expediters under the administration of purchasing management. To summarize the reasons for this conclusion:

1. Engineers generally have the aptitudes and the training necessary to understand when material and equipment must be inspected and to be of real help in recognizing and solving delivery problems while expediting. They also provide the technical ability necessary to evaluate sources where quality is paramount in the choice of bidders.
2. Inspection and expediting are inseparable from buying because, in a legal sense, inspection and expediting are functions necessary in the more complex purchases in order to reach agreement currently on terms and to see that the terms are met.
3. Inspectors and expediters deal almost continually with suppliers and contractors, which is a function of purchasing. Their combined experience and engineering education is of great assistance in guiding the buyer and the process engineers through the necessary steps for the procurement of highly technical equipment.
4. There is no clash with the engineering department or with operating groups — so long as engineers of experience are employed — engineers who understand and operate within proper limits of authority and, when necessary, seek cooperation from the engineers for whom the equipment is being purchased.
5. Engineers as inspectors and expediters who have gained experience in purchasing not only see and understand things in the shops that buyers must know, but also can express themselves in concise terms which are of technical assistance to the engineering department and operating engineers.

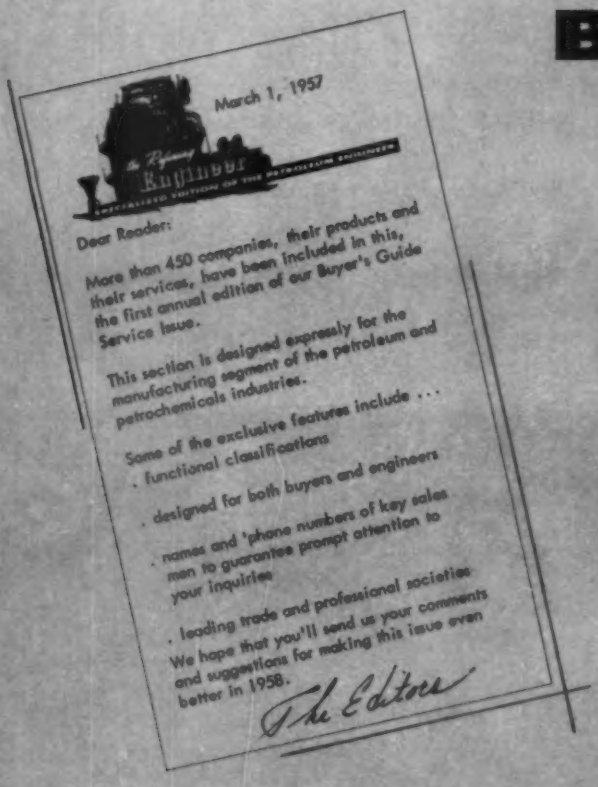
The engineer need not be lost in the purchase and stores department. The work develops characteristics necessary for management positions. It presents a variety of problems daily; it offers numerous opportunities to influence and guide others. Inspection and expediting require broadening experiences, such as travel, working with many people at all levels of business, and working alone away from home ties. These experiences are particularly good for an engineer because he must learn to appraise quickly complex situations in unfamiliar surroundings, analyze a maze of detail, and bring order out of chaos. He must be decisive while practicing compromise. Inspection and expediting and related materials-engineering consulting service in the purchase and stores deparmtent are fields in which to exercise individual initiative and growth and to influence developments. All of these are good and satisfying for the individual and are, therefore, profitable for the company because they develop habits and attitudes that are necessary in supervisory positions.

The company has found that engineers are a profitable and logical addition to the purchases and stores group.

* * *

the Refining **Engineer's**

BUYER'S GUIDE


March 1, 1957

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Anodes, Corrosion Protecting
New Jersey Zinc Co.
Pipe Line Anode Corp.

Brick
ACID RESISTING BRICK
Illinois Clay Products Company
Johns-Manville Corporation
Maurice A. Knight Company
U. S. Stoneware Company
REFRACTORY BRICK
Babcock and Wilcox Company
M. H. Detrick Company
Illinois Clay Products Company
The Ironton Firebrick Company
Johns-Manville Corporation
The Norton Company

Cable and Wire Rope
American Cable Division
Hazard Wire Rope Division
✔ Jones & Laughlin Steel Corp.
Pittsburgh Steel Company
U. S. Steel Corp., Supply Div.
✔ Youngstown Sheet & Tube Co.

Castings and Forgings
Alco Products, Inc.
✔ Ampco Metal, Inc.
Babcock and Wilcox Company
Commercial Iron Works
✔ Goslin Birmingham Mfg. Co.
Lufkin Foundry & Machine Corp.
U. S. Pipe & Foundry Company

Cement
ACID RESISTING CEMENT
Atlas Mineral Products Company
Illinois Clay Products Company
Johns-Manville Corp.
Maurice A. Knight Company
U. S. Stoneware Company
PORTLAND CEMENT
Universal Atlas Cement Co.
REFRACTORY CEMENT
Babcock & Wilcox Co.
Bigelow-Liptak Corp.
M. H. Detrick Co.
Illinois Clay Products Co.
The Ironton Fire Brick Co.
Johns-Manville Corp.
The Norton Co.
U. S. Stoneware Co.

Chain
American Chain Division
DECKING AND GRATING
✔ Borden Metal Products Co.
Eastern Stainless Steel Corp.
Hendrick Manufacturing Co.
✔ Irving Subway Grating Co.
✔ Jones & Laughlin Steel Corp.
Klemp Metal Grating Co.
Joseph H. Ryerson & Sons, Inc.

Insulating Materials
Babcock & Wilcox Co.
Barrett Div., Allied Chem. & Dye
M. H. Detrick Co.
B. F. Goodrich Ind. Prod. Co.
Illinois Clay Products Co.
Insul-Mastic Corp. of America
The Ironton Fire Brick Co.
Johns-Manville Corp.
L-O-F Glass Fibers Co.
Owens-Illinois Glass Co., Kaylo

Jacketing-Aluminum
Aluminum Corp. of America
Aseeco, Inc.
Childers Mfg. Co.
Harvey Aluminum Co.
Revere Copper and Brass, Inc.

Linings-Pipe and Vessel
BITUMENS LININGS
Barrett Div., Allied Chem. & Dye
Insul-Mastic Corp. of America
Lion Oil Company
CERAMIC LININGS
Bigelow-Liptak Corp.
Maurice A. Knight Co.
U. S. Stoneware Co.
FIBERGLASS AND GLASS LININGS
Maurice A. Knight Co.
L-O-F Glass Fibers Co.
GUNITE LININGS
Atlas Mineral Products Co.
Bigelow-Liptak Corp.
Emjay Maintenance Engineers
Maurice A. Knight Co.
PLASTIC AND RUBBER LININGS
Amercoat Corp.
Atlas Mineral Products Co.
Dow Corning Corp.
Durethene-Koppers Co.
Gates Engineering Co.
B. F. Goodrich Ind. Prod. Co.
Maurice A. Knight Co.
Plastic Applicators, Inc.
Thiokol Chemical Corp.
United States Rubber Co.
METAL LININGS
Klemp Metal Grating Co.
Arthur Tickle Eng. Works
U. S. Pipe & Foundry Corp.
WRAPPING TAPES, PIPELINE
Chicago Gasket Co.
Dow Corning Corp.
Kendall Co., Polyken Div.
LOF Glass Fibers, Inc.
Minnesota Mining & Mfg. Co.

Metals & Alloys in Mill Forms
ALUMINUM
Aluminum Co. of America
Harvey Aluminum Co.
Kaiser Aluminum Co.
Revere Copper & Brass, Inc.
Reynolds Metals Co.
U. S. Steel Supply Division
BRASS
American Brass Company
Chase Brass & Copper Co.
Revere Copper & Brass, Inc.
COPPER
American Brass Co.
✔ Ampco Metal, Inc.
Chase Brass & Copper Co.
Revere Copper & Brass, Inc.
FERRO-NICKEL
Alleghany Ludlum Steel Corp.
American Nickel Alloy Mfg. Co.
Babcock & Wilcox Co.
International Nickel Co.
✔ Youngstown Sheet & Tube Co.
LEAD
Federated Metals Division
NICKEL
American Nickel Alloy Mfg. Corp.
Babcock & Wilcox Co.
International Nickel Co.
NICKEL-CHROME
American Nickel Alloy Mfg. Corp.
Babcock & Wilcox Co.
International Nickel Co.
NICKEL-COPPER
American Nickel Alloy Mfg. Corp.
✔ Ampco Metal, Inc.
International Nickel Co.
SPECIAL CORROSION RESISTING ALLOYS
✔ Ampco Metals, Inc.
Haveg Corp.
Haynes Stellite Co.
STEEL, LOW ALLOY
Alleghany Ludlum Steel Corp.
Babcock & Wilcox Co.
Bethlehem Steel Co.
Harvey Aluminum Co.
✔ Jones & Laughlin Steel Corp.
Pittsburgh Steel Co.
Republic Steel Corp.
Joseph H. Ryerson & Sons, Inc.
U. S. Steel Supply Division
✔ Youngstown Sheet & Tube Co.
STEEL, STAINLESS
Alleghany Ludlum Steel Corp.
American Nickel Alloy Mfg. Corp.
Babcock & Wilcox Co.
Eastern Stainless Steel Corp.
International Nickel Co.
Republic Steel Corp.
Joseph H. Ryerson & Sons, Inc.
U. S. Steel Supply Division
✔ Youngstown Sheet & Tube Co.
TITANIUM
Harvey Aluminum Co.
ZINC
New Jersey Zinc Co.

Paints and Coatings
Amercoat Corp.
American Bitumuls & Asphalt Co.
Barrett Div., Allied Chem. & Dye
Dow Corning Corp.
Gates Engineering Co.
✔ Glidden Co.
✔ Humble Oil & Refining Co.
Insul-Mastic Corp. of America
Johns-Manville Corp.
Lion Oil Co.
Plastic Applicators, Inc.
Rust-Oleum Corporation
Sherwin-Williams Co.
Silicones Div., Union Carbide
Thiokol Chemical Corp.
United States Rubber Co.
U. S. Stoneware Co.

Plastic Sheet and Structures
Atlas Mineral Products Co.
Chicago Gasket Co.
Colonial Plastic Mfg. Co.
B. F. Goodrich Ind. Prod. Co.
L-K Pump Valve Co.
Joseph H. Ryerson & Sons, Inc.
Sherwin-Williams Co.
United States Rubber Co.

Pipe and Tubing
See Pipe and Tubing Section

Walkways and Stairways
Black, Sivalls & Bryson, Inc.
✔ Borden Metal Products Co.
Columbian Steel Tank Co.
✔ Irving Subway Grating Co.
Klemp Metal Grating Co.
✔ National Tank Co.

Wire Cloth and Mesh
C. O. Jelliff Mfg. Corp.
Multi-Metal Wire Cloth Co.
Newark Wire Cloth Co.
Otto H. York Co., Inc.

Electrical Equipment

Cable and Wire
General Electric Co.
The Okonite Co.
RESISTANCE WIRE
C. O. Jelliff Mfg. Co.

Circuit Breakers and Interrupters
Allis-Chalmers Mfg. Co.
Assembly Products, Inc.
Cutler-Hammer, Inc.
General Electric Co.
Square D Co.
Westinghouse Electric Co.

Communications Equipment
AMPLIFIERS
Alleghany Instrument Co.
Associated Eng. Equip. Co.
Bendix Aviation Co., Pac. Div.
The Bristol Co.
✔ Consolidated Electrodynamics
Fielden Instrument Division
General Electric Co.
✔ Hammarlund Mfg. Co.
Westinghouse Electric Corp.
MICRO-WAVE
✔ Hammarlund Mfg. Co.
Raytheon Mfg. Co.
Westinghouse Electric Corp.
RADIO
Automatic Electric Sales Corp.
General Electric Co.
Hammarlund Mfg. Co.
Raytheon Mfg. Co.
Westinghouse Electric Co.
TELEMETERING
Bendix Aviation Co., Pac. Div.
The Bristol Company
Fielden Instrument Division
General Electric Co.
✔ Hammarlund Mfg. Co.
Shand & Jurs Co.
Westinghouse Electric Corp.
TELEPHONE SYSTEMS
Automatic Electric Sales Corp.
TELEVISION-INDUSTRIAL
General Electric Co.
Raytheon Mfg. Co.
Westinghouse Electric Corp.

Condensers
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse Electric Corp.

Contactors and Relays
Allis-Chalmers Mfg. Co.
Assembly Products, Inc.
Automatic Switch Co.
Cutler-Hammer, Inc.
General Electric Co.
Square D Co.
Westinghouse Electric Corp.
Weston Electric Instr. Corp.

Control Systems and Instruments—Power
Allis-Chalmers Mfg. Co.
Assembly Products, Inc.
Automatic Switch Co.
Cutler-Hammer, Inc.
✔ Electric Machinery Mfg. Co.
General Electric Co.
Square D Co.
Westinghouse Electric Corp.
Weston Electrical Inst. Corp.

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Converters
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse Electric Corp.

Fittings and Receptacles—Explosion Proof
Appleton Electric Co.
Crouse-Hinds Co.
Killark Electrical Mfg. Co.
Pyle-National Co.

Generators—AC and DC
Allis-Chalmers Mfg. Co.
✔ Electric Machinery Mfg. Co.
General Electric Co.
Homelite, Div. of Textron
Master Electric Co.
The Peerless Electric Co.
Westinghouse Electric Corp.
Worthington Corp.

Heaters—Electrical
(Direct, Tubular, etc.)
Allis-Chalmers Mfg. Co.
General Electric Co.
Hynes Electric Heating Div.
Westinghouse Electric Corp.

Magnets, Lifting
Cutler-Hammer, Inc.
Square D Co.

Motor Control Centers & Starters
Allis-Chalmers Mfg. Co.
Automatic Switch Co.
Cutler-Hammer, Inc.
✔ Electric Machinery Mfg. Co.
General Electric Co.
Square D Co.
Westinghouse Electric Corp.
Worthington Corp.

Motors—Electrical
See Motors and Engines Section

Rectifiers
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse Electric Corp.

Regulators—Voltage
Allis-Chalmers Mfg. Co.
General Electric Co.
Superior Electric Co.
Westinghouse Electric Corp.

Rheostats
Allis-Chalmers Mfg. Co.
Cutler-Hammer, Inc.
General Electric Co.
Square D Co.
Westinghouse Electric Corp.

Solenoids
Allis-Chalmers Mfg. Co.
Automatic Switch Co.
General Electric Co.
Square D Co.
Westinghouse Electric Corp.

Substations
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse Electric Corp.

Switchgear
Allis-Chalmers Mfg. Co.
Automatic Switch Co.
Cutler-Hammer, Inc.
✔ Electric Machinery Mfg. Co.
General Electric Co.
Killark Electrical Mfg. Co.
Square D Co.
Superior Electric Co.
Westinghouse Electric Corp.
Worthington Corp.

Transformers
Allis-Chalmers Mfg. Co.
General Electric Co.
Superior Electric Company
Westinghouse Electric Corp.

Furnaces, Heaters, Steam Boilers, and Accessories

Arches and Tube Supports
M. H. Detrick Co.
The Engineer Co.
Geo. P. Reintjes Co.

Burners, Industrial
COKE AND COAL—PULVERIZED
Allis-Chalmers Mfg. Co.
Babcock & Wilcox Co.
Combustion Engineering, Inc.
Erie City Iron Works
Riley Stoker Corp.
COMBINATION OIL AND GAS
Babcock & Wilcox Co.
Eclipse Fuel & Engineering Co.
The Engineer Co.
Erie City Iron Works
Hauck Manufacturing Co.
Ray Oil Burner Co.
Riley Stoker Corp.
John Zink Mfg. Co.
GAS BURNERS
Allis-Chalmers Mfg. Co.
Babcock & Wilcox Co.
Cleaver-Brooks Co.
Eclipse Fuel & Engr. Co.
The Engineer Co.
Erie City Iron Works
Hauck Manufacturing Co.
Iron Fireman Mfg. Co .
Ray Oil Burner Co.
Riley Stoker Corp.
John Zink Mfg. Co.
OIL BURNERS
Allis-Chalmers Mfg. Co.
Babcock & Wilcox Co.
Cleaver-Brooks Co.
Eclipse Fuel & Eng. Co.
The Engineer Co.
Erie City Iron Works
Hauck Mfg. Co.
Iron Fireman Mfg. Co.
Ray Oil Burner Co.
Riley Stoker Corp.
Schutte & Koerting Co.
John Zink Mfg. Co.
SULFUR BURNERS
Acme Coppersmithing & Mach.
Schutte & Koerting Co.
John Zink Mfg. Co.

Condensate Return Systems
Cochrane Corporation
Eclipse Fuel & Engineering Co.

Carbon Monoxide Boilers
Babcock & Wilcox Co.
Combustion Engineering Co.

Control Systems
See Instruments & Control Sect.

Fuel Pumps
See Pumps & Compressors Sect.

Furnace Enclosures
Bigelow-Liptak Corp.
M. H. Detrick Co.
Geo. P. Reintjes Co.

Igniters and Pilots
Black, Sivalls & Bryson, Inc.
✔ Stitt Ignition Co.

Kilns, Rotary
Acme Coppersmithing & Mach.
Allis-Chalmers Mfg. Co.
Hardinge Co.
Nichols Eng. & Research Corp.

Multiple Hearth Furnaces
Nichols Eng. & Research Corp.

Process Furnaces and Heaters
Alcorn Combustion Co.
Foster Wheeler Corp.
M. W. Kellogg Co.
The Lummus Co.
✔ Petro-Chem Development Co.
Selas Corporation of America
Struthers Wells Corp.

Refractories
See Construction Materials Sect.

Steam Separators
Armstrong Machine Works
Cochrane Corporation
Hagan Corp.
Schutte & Koerting Co.
Strong, Carlisle & Hammond Div.
Yarnall-Waring Co.

Steam Boilers and Generators
Ames Iron Works, Inc.
Babcock & Wilcox Co.
Cleaver-Brooks Co.
Combustion Engineering, Inc.
Eclipse Fuel Engineering Co.
Erie City Iron Works
Foster Wheeler Corp.
The Griscom-Russell Co.
The Lummus Co.
Murray Iron Works Co.
✔ National Tank Co.
Ray Oil Burner Co.
Riley Stoker Corp.
Union Iron Works
✔ Henry Vogt Machine Co.
The Wickes Boiler Co.

Water Treating Equipment
See Water Treating Equip. Sect.

Heat Exchange Equipment

Air Conditioning and Heating Equipment
AIR CONDITIONERS
General Electric Co.
Westinghouse Corp.
Worthington Corp.
✔ Young Radiator Co.
DEHUMIDIFIERS
Industrol Corp.
Worthington Corp.
HUMIDIFIERS
Armstrong Machine Works
Worthington Corp.
✔ Young Radiator Co.
HEATING SYSTEMS & UNITS
General Electric Co.
Grinnell, Inc.
L. J. Wing Mfg. Co.
Worthington Corp.

Air Coolers and Condensers
Degree Corp.
Erie City Iron Works
The Griscom-Russell Co.
The Happy Co.
Hudson Engineering Corp.
Western Supply Co.
Worthington Corp.
✔ Young Radiator Co.

Air Preheaters
Babcock & Wilcox Co.
Combustion Engineering Co.
Erie City Iron Works
Whitlock Manufacturing Co.
John Zink Mfg. Co.

Cooling and Heating Coils
PIPE & TUBING COILS
Acme Coppersmithing & Mach.
Brown Fintube Co.
Condenser Service & Eng Co.
The Griscom-Russell Co.
Parker Appliance Co.
✔ Henry Vogt Machine Co.
Whitlock Manufacturing Co.
PLATE TYPE
The Griscom-Russell Co.
Tranter Manufacturing Co.

Cooling Towers
Fluor Products Co.
The Griscom-Russell Co.
Hudson Engineering Corp.
The Marley Co.
J. F. Pritchard & Co.
Woolford Wood Tank Co.

Coolers—Rotary
Allis-Chalmers Mfg. Co.
Combustion Engineering Co.

Condensers
BAROMETRIC CONDENSERS
Acme Coppersmithing & Mach.
✔ Ingersoll Rand Co.
The Lummus Co.
Ross Heat Exchanger Division
Schutte & Koerting Co.
Worthington Corp.
JET EJECTOR CONDENSERS
Acme Coppersmithing & Mach.
✔ Ingersoll Rand Co.
The Lummus Co.
Schutte & Koerting Co.
Worthington Corp.
STEAM CONDENSERS
Allis-Chalmers Mfg. Co.
Condenser Service & Eng. Co.
Downingtown Iron Works
Foster Wheeler Corp.

For additional information on products, services, and prices, use the enclosed Business Reply Cards.

✔ Ingersoll Rand Co.
M. W. Kellogg Co.
The Lummus Co.
✔ Henry Vogt Machine Co.
Westinghouse Electric Corp.
Whitlock Manufacturing Co.
Worthington Corp.

SURFACE CONDENSERS
Acme Coppersmithing & Mach.
Allis-Chalmers Mfg. Co.
✔ Goslin Birmingham Mfg. Co.
✔ Ingersoll Rand Co.
The Lummus Co.
Ross Heat Exchanger Division
The Worthington Corp.

Fans, Air Cooler & Water Cooling Tower
Hartzell Propeller Fan Co.
Hudson Engineering Corp.
✔ Koppers Company, Fan Div.

Heat Exchangers
DOUBLE PIPE HEAT EXCHANGERS
Acme Coppersmithing & Mach.
Alco Products, Inc.
Brown Fintube Co.
✔ Goslin Birmingham Mfg. Co.
The Griscom-Russell Co.
Heat-X, Inc.
✔ National Tank Co.
Ross Heat Exchanger Division
Schutte & Koerting, Inc.
✔ Henry Vogt Machine Co.
Whitlock Mfg. Co.
✔ Wolverine Tube Division

SHELL AND TUBE HEAT EXCHANGE EQUIPMENT
Acme Coppersmithing & Mach.
Adsco Industries, Inc.
Alco Products, Inc.
Richard M. Armstrong Co.
Brown Fintube Co.
Chicago Pneumatic Tool Co.
Condenser Service & Eng. Co.
Downingtown Iron Works, Inc.
Foster Wheeler Corp.
✔ Goslin Birmingham Mfg. Co.
The Griscom-Russell Co.
Heat-X, Inc.
M. W. Kellogg Co.
The Lummus Co.
Manning & Lewis Eng. Co.
✔ National Tank Co.
National U. S. Radiator Corp.
Ross Heat Exchanger Div.
Schutte & Koerting, Inc.
Southwestern Engineering Co.
Struthers Wells Corp.
Texas Metal Fabricating Co.
✔ Henry Vogt Machine Co.
Vulcan-Cincinnati, Inc.
Western Supply Co.
Westinghouse Electric Corp.
Whitlock Mfg. Co.
Worthington Corp.
✔ Young Radiator Co.

Tubing—Heat Exchanger
FINNED TUBING
Alco Products, Inc.
American Brass Co.
Brown Fintube Co.
The Griscom-Russell Co.
Hudson Engineering Co.
Reading Tube Co.
✔ Wolverine Tube

PLAIN TUBING
Alco Products, Inc.
American Brass Co.
Babcock & Wilcox Co.
Chase Brass & Copper Co.
✔ Jones & Laughlin Steel Co.
Michigan Seamless Tube Co.
A. B. Murray Co., Inc.
National Tube Div., U S Steel
Revere Copper & Brass Co.
Standard Tube Corp.
✔ Wolverine Tube Division

Instruments & Control Equipment

Alarms and Annunciators
Brooks Rotameter Co.
Magnetrol, Inc.
Panellit, Inc.
Shand & Jurs Co.
Yarnall-Waring Co.

Automatic Controllers & Regulators
FLOW OF LIQUIDS AND GASES
✔ American Meter Co.
Atlas Valve Co.
Bailey Meter Co.
Black, Sivalls and Bryson, Inc.
The Bristol Co.
Brooks Rotameter Co.
Conoflow Corp.
Eclipse Fuel Engineering Co.
Fischer & Porter Co.
Foster Engineering Co.
The Foxboro Co.
Magnetrol, Inc.
Manning, Maxwell & Moore, Inc.
Minneapolis-Honeywell Reg. Co.
Norwood Controls, Unit of Detroit Controls
Oil Met. & Pro. Equipt. Corp.
Proportioneers, Inc.
Republic Flow Meters Co.
Taylor Instrument Co.

LIQUID LEVEL
Bailey Meter Co.
Black, Sivalls & Bryson, Inc.
The Bristol Co.
Eclipse Fuel & Engineering Co.
Fielden Instruments Division
✔ Fisher Governor Co.
Foster Engineering Co.
The Foxboro Co.
The Guiberson Corp.
Infilco, Inc.
Jo-Bell Products, Inc.
Kieley & Mueller, Inc.
Leslie Co.
Magnetrol, Inc.
Manning, Maxwell & Moore, Inc.
Mason-Neilan Regulator Co.
✔ National Tank Co.
Republic Flow Meters Co.
Taylor Instrument Co.

PRESSURE CONTROL
✔ American Meter Co.
Atlas Valve Co.
Bailey Meter Co.
Black, Sivalls & Bryson, Inc.
The Bristol Co.
Clark Manufacturing Co.
Conoflow Corp.
Crosby Steam Gage & Valve Co.
Eclipse Fuel Engineering Co.
Fielden Instruments Division
Fischer & Porter Co.
✔ Fisher Governor Co.
Foster Engineering Co.
The Foxboro Co.
General Controls Co.
The Guiberson Corp.
Hagan Corp.
Kieley & Mueller Co.
Leslie Co.
Manning, Maxwell & Moore, Inc.
✔ Jas. P. Marsh Corp.
Mason-Neilan Regulator Corp.
Minneapolis-Honeywell Reg. Co.
Norwood Controls, Unit of Detroit Controls
Republic Flow Meters Co.
Rockwell Manufacturing Co.
Sarco Co., Inc.
Schutte & Koerting Co.
Shand & Jurs Co.
Taylor Instrument Companies
U. S. Gauge Division
Weston Electrical Instr. Corp.
Yarnall-Waring Co.

TEMPERATURE CONTROL
Assembly Products, Inc.
Atlas Valve Co.
Bailey Meter Co.
Black, Sivalls and Bryson, Inc.
The Bristol Co.
Eclipse Fuel & Engineering Co.
Fielden Instrument Division
Fischer & Porter Co.
Foster Engineering Co.
The Foxboro Co.
General Controls Co.
Hagan Corp.
Hallikainen Instruments
Illinois Testing Laboratories
Leeds & Northrup Co.
Leslie Co.
Magnetrol, Inc.
Manning, Maxwell & Moore, Inc.
✔ Jas. P. Marsh Corp.
Minneapolis-Honeywell Reg. Co.
Norwood Controls, Unit of Detroit Controls
Precision Therm. & Instr. Co.
Sarco Company, Inc.
Taylor Instrument Companies
U. S. Gauge Division
West Instrument Corp.
Weston Electrical Instr. Corp.
Wheelco Instruments Division

DRAFT CONTROL
Bailey Meter Co.
The Bristol Co.
The Foxboro Co.
Hagan Corp.
Republic Flow Meters Co.

Calibration Equipment
ELECTRONIC INSTRUMENTS
Alleghany Instrument Co.
✔ Beckman Instruments, Inc.
The Bristol Co.
✔ Consolidated Electrodynamics
Manning, Maxwell & Moore, Inc.
Minneapolis-Honeywell Reg. Co.

FLOW METERS
Black, Sivalls & Bryson, Inc.
Brooks Rotameter Co.
Condenser Service & Eng. Corp.
Fischer & Porter Co.
The Foxboro Co.
Oil Met. & Pro. Equipt. Corp.
Warner Lewis Co.

PRESSURE GAUGES
Crosby Steam Gauge & Valve Co.
The Foxboro Co.
Manning, Maxwell & Moore, Inc.
Minneapolis-Honeywell Reg. Co.
United States Gauge Division

Combustion Control Systems
Bailey Meter Co.
The Bristol Co.
General Controls Co.
Hagan Corp.
Leeds & Northrup Co.
Republic Flow Meter Co.
Wheelco Instruments Division

Continuous Analyzers
BOILING POINT DETERMINATION
Hallikainen Instruments

CHROMATOGRAPHER
Baird-Atomic, Inc.
✔ Beckman Instruments Co.
Hallikainen Instruments
Mine Safety Appliances Co.
Perkin-Elmer Corporation

COLORIMETERS
✔ Beckman Instruments, Inc.
Hallikainen Instruments
Leeds & Northrup Co.
Manufacturers Eng. & Equipt.

CONDUCTIVITY-THERMAL
Baird-Atomic, Inc.
✔ Beckman Instruments, Inc.
✔ Consolidated Electrodynamics
Leeds & Northrup Co.
Perkin-Elmer Corp.
Victory Eng. Co. (Thermistors)

CONDUCTIVITY—ELECTRICAL
Bailey Meter Co.
The Foxboro Co.
Hagan Corp.
Leeds & Northrup Co.

DEW POINT ANALYZERS
The Foxboro Co.
Illinois Testing Labs.

FLUE GAS ANALYZERS
✔ Consolidated Electrodynamics
Mine Safety Appliances Co.
Republic Flow Meters Co.
Victory Engineering Co.

HUMIDITY MEASUREMENT
✔ Beckman Instruments, Inc.
The Bristol Co.
The Foxboro Co.
King Engineering Co.

pH METERS
✔ Beckman Instruments, Inc.
The Bristol Co.
The Foxboro Co.
Hallikainen Instruments
Leeds & Northrup Co.
Weston Electrical Instr. Corp.

RADIOLOGICAL MEASUREMENT
Baird-Atomic, Inc.
Hallikainen Instruments
✔ Isotope Specialties Co.
Radiation Counters Labs, Inc.
Tracer Lab, Inc.

SMOKE DENSITY
The Bristol Co.
Leeds & Northrup Co.

SPECIFIC GRAVITY
The Bristol Co.
Brooks Rotometer Co.
Fischer & Porter Co.
The Foxboro Co.
Potter Aeronautical Corp.
Precision Therm. & Instr. Co.

SPECTROGRAPHIC ANALYZERS
Baird-Atomic, Inc.
✔ Beckman Instruments, Inc.
✔ Consolidated Electrodynamics
Hallikainen Instruments
Leeds & Northrup Co.
Mine Safety Appliances Co.
Perkin-Elmer Corp.
Process & Instruments, Inc.
Radiation Counter Laboratories

✔ Advertisement in this issue, index is on page A-6.

VAPOR PRESSURE MEASUREMENT
Hallikainen Instruments
VISCOSITY ANALYZERS
Brookfield Engineering Labs
Brooks Rotometer Co.
Fischer & Porter Co.
Hallikainen Instruments
Schutte & Koerting

Control Valves
HYDRAULICALLY OPERATED
Automatic Switch Co.
Conoflow Corp.
Equipment Engineers, Inc.
Foster Engineering Co.
The Foxboro Co.
Hagan Corp.
Hanna Engineering Works
Homestead Valve Mfg. Co.
Kieley & Mueller, Inc.
Ledeen Mfg. Co.
Leslie Co.
✔ The Lunkenheimer Co.
Mason-Neilan Regulator Co.
Republic Flow Meters Co.
Shand & Jurs Co.
MOTOR OPERATED
Automatic Switch Co.
Black, Sivalls & Bryson, Inc.
The Bristol Co.
Builders-Providence, Inc.
Conoflow Corp.
✔ Fisher Governor Co.
Foster Engineering Co.
The Foxboro Co.
General Controls Co.
The Guiberson Corp.
Hammel-Dahl Co.
Hanna Engineering Works
Kieley & Mueller, Inc.
Ledeen Manufacturing Co.
Leslie Co.
✔ The Lunkenheimer Co.
Manning, Maxwell & Moore, Inc.
✔ Jas. P. Marsh Corp.
Republic Flow Meters Co.
Shand & Jurs Co.
A. O. Smith Corp.
Taylor Instrument Companies
Weston Electrical Instr. Corp.
SOLENOID VALVES
Aktomatic Valve Company, Inc.
Automatic Switch Co.
Barksdale Valves
The Bristol Co.
Eclipse Fuel & Eng. Co.
The Foxboro Co.
General Controls Co.
Hanna Engineering Works
✔ The Lunkenheimer Co.
✔ Jas. P. Marsh Corp.
Mason-Neilan Regulator Co.
Weston Electrical Instr. Corp.

Counters, Integrators & Totalizers
Baird-Atomic, Inc.
Ralph N. Brodie Co.
Buffalo Meter Co.
Builders-Providence, Inc.
Potter Aeronautical Corp.
Rockwell Manufacturing Co.
A. O. Smith Corp.

Data Loggers, Data Reduction Systems
Alleghany Instrument Co.
✔ Beckman Instruments, Inc.
✔ Consolidated Electrodynamics
Epsco, Inc.
Fischer & Porter Co.
Panellit, Inc.

Electronic Control Systems
Alleghany Instrument Co.
Baird-Atomic, Inc.
Bendix Aviation, Pacific Div.
BJ Electronics, Div. Byron Jackson Pumps
✔ Consolidated Electrodynamics
Epsco, Inc.
Fischer & Porter Co.
Hagan Corp.
Librascope, Inc.
Manning, Maxwell & Moore, Inc.
Minneapolis-Honeywell Reg. Co.
Texas Instruments, Inc.

Electronic Computors
ANALOG COMPUTERS
Alleghany Instrument Co.
✔ Consolidated Electrodynamics
International Bus. Mach. Corp.
Librascope, Inc.
Perkin-Elmer Corp.
DIGITAL COMPUTERS
Alleghany Instrument Co.
✔ Consolidated Electrodynamics
International Bus. Mach. Corp.
Librascope, Inc.
COMPUTOR COMPONENTS
Baird-Atomic, Inc.
✔ Consolidated Electrodynamics
Epsco, Inc.
Fischer & Porter Co.
International Bus. Mach. Corp.
Librascope, Inc.

Flow Meters
DISPLACEMENT, POSITIVE
Buffalo Meter Co.
Rockwell Manufacturing Co.
Roots-Connorville Blower Div.
A. O. Smith Corp.
Worthington Corp.
FLOW NOZZLES, TUBES, AND VENTURIS
Builders-Providence, Inc.
Burgess-Manning Co.
Foster Engineering Co.
The Foxboro Co.
Infilco, Inc.
ORIFICE METERS
✔ American Meter Co.
✔ Barton Instrument Corp.
Bailey Meter Co.
The Bristol Co.
Burgess-Manning Co.
Daniel Orifice Fitting Co.
Fischer & Porter Co.
The Foxboro Co.
Manning, Maxwell & Moore, Inc.
Republic Flow Meters Co.
Robinson Orifice Fitting Co.
Taylor Instrument Companies
ORIFICE FITTINGS AND PLATES
✔ Barton Instrument Corp.
Burgess-Manning Co.
Commercial Iron Works
Daniel Orifice Fitting Co.
Fischer & Porter Co.
The Foxboro Co.
Manning, Maxwell & Moore, Inc.
Robinson Orifice Fitting Co.
Yale Sales Co.
ROTAMETERS
Brooks Rotameter Co.
Burgess-Manning Co.
Ernst Water Column & Gage Co.
Fischer & Porter Co.
Hallikainen Instruments
Jerguson Gage & Valve Co.
King Engineering Co.
The Matheson Co., Inc.
Schutte & Koerting Co.
Selas Corp. of America
POTARY METERS
Ralph N. Brodie Co., Inc.
Oil Met. & Pro. Equipt. Corp.
Rockwell Manufacturing Co.
Worthington Corp.
ROTARY MAGNETIC
Potter Aeronautical Corp.
STRAIGHTENING VANES
Daniel Orifice Fitting Co.
Robinson Orifice Fitting Co.
VOLUME METERS
✔ National Tank Co.
Oil Met. & Pro. Equipt. Co.

Level Measurement
BUBBLER TYPE
The Foxboro Co.
ELECTRONIC ELEMENT
Fielden Instrument Division
Gilbert & Barker Mfg. Co.
Texas Instruments, Inc.
FLOAT TYPE
Bailey Meter Co.
Fielden Instrument Division
✔ Fisher Governor Co.
The Foxboro Co.
Manning, Maxwell & Moore, Inc.
Mason-Neilan Regulator Co.
✔ National Tank Co.
Oil Met. & Pro. Equipt. Corp.
Shand & Jurs Co.
Taylor Instrument Companies
GAUGE GLASSES
Bailey Meter Co.
Ernst Water Column & Gage Co.
Infilco, Inc.
Jerguson Gage & Valve Co.
King Engineering Co.
✔ The Lunkenheimer Co.
✔ Jas. P. Marsh Corp.
Penberthy Manufacturing Co.
✔ The Wm. Powell Co.
Shand & Jurs Co.
Yarnall-Waring Co.
RADIO CHEMICALS
✔ Isotopes Specialties Co.
Radiation Counter Laboratories
Tracerlab, Inc.
SOLIDS
Bin-Dicator Corp.

Manometers
MERCURY
✔ Barton Instrument Corp.
Black, Sivalls & Bryson, Inc.
The Bristol Co.
Hagan Corp.
King Engineering Co.
The Foxboro Co.
Manning, Maxwell & Moore, Inc.
Republic Flow Meters Co.
Taylor Instrument Companies
FORCE BALANCED CELLS
✔ Barton Instrument Corp.
The Bristol Co.
The Foxboro Co.
Manning, Maxwell & Moore, Inc.
Mason-Neilan Regulator Co.
Taylor Instrument Companies

Panel Boards
The Bristol Co.
Fischer & Porter Co.
The Foxboro Co.
Graphic Systems
Manning, Maxwell & Moore, Inc.
Panellit, Inc.
Taylor Instrument Companies

Pressure and Vacuum Gauges
The Bristol Company
✔ Byron Jackson Pumps, Inc.
✔ Consolidated Electrodynamics
Crosby Steam Gage & Valve
Electric Auto-Lite Company
General Controls Company
Helicoid Gauge Division
Manning, Maxwell & Moore, Inc.
✔ Jas. P. Marsh Corporation
Minneapolis-Honeywell Reg. Co.
✔ Oil Well Supply Div. U S Steel
Precision Therm. & Instr. Co.
Taylor Instrument Companies
United States Gauge Division

Radiochemical Measurements
Baird-Atomic, Inc.
✔ Isotopes Specialties Company
Radiation Counter Laboratories
Tracerlab, Inc.

Recorders and Indicators
FLOW
✔ American Meter Company
Bailey Meter Company
✔ Barton Instrument Corporation
Black, Sivalls & Bryson, Inc.
Brooks Rotameter Company
Burgess-Manning Company
Fischer & Porter Company
The Foxboro Company
Hagan Corporation
Manning, Maxwell & Moore, Inc.
Norwood Controls, Unit of Detroit Controls
Republic Flow Meter Company
Schutte & Koerting Company
LEVEL
Bailey Meter Company
✔ Barton Instrument Corp.
Black, Sivalls & Bryson, Inc.
The Bristol Company
Burgess-Manning Company
Fielden Instrument Division
The Foxboro Company
Gilbert & Barker Mfg. Co.
Jerguson Gage & Valve Co.
Panellit, Inc.
Republic Flow Meters Company
Shand & Jurs Company
Taylor Instrument Companies
Yarnall-Waring Company
PRESSURE
✔ Barton Instrument Corporation
Bailey Meter Company
Black, Sivalls & Bryson, Inc.
Burgess-Manning Company
Crosby Steam Gage & Valve Co.
Electric Auto-Lite Company
The Foxboro Company
General Controls Company
Hagan Corporation
Manning, Maxwell & Moore, Inc.
National Research Corporation
Norwood Controls, Unit of Detroit Controls
Republic Flow Meters Company
United States Gauge Division
Taylor Instrument Companies
TEMPERATURE
Assembly Products, Inc.
Bailey Meter Company
Black, Sivalls & Bryson, Inc.
The Bristol Company
Burgess-Manning Company
Condenser Service & Eng. Co.
Thomas A. Edison, Instr. Div.
Electric Auto-Lite Company
Fielden Instrument Division
General Controls Company
Hagan Corporation
Illinois Testing Laboratories
Manning, Maxwell & Moore, Inc.
Leeds & Northrup Company
Norwood Controls, Unit of Detroit Controls
Pyrometer Instrument Company
Republic Flow Meters Company
Taylor Instrument Companies
United States Gauge Division
West Instrument Corporation
Westinghouse Electric Corp.
Weston Electrical Instr. Corp.
Wheelco Instruments Division

For additional information on products, services, and prices, use the enclosed Business Reply Cards.

GENERAL PURPOSE
- Bailey Meter Company
- ✔ Barton Instrument Corporation
- The Bristol Company
- Builders-Providence, Inc.
- Fielden Instrument Division
- Fischer & Porter Company
- The Foxboro Company
- Hagan Corporation
- Librascope, Inc.
- Manning, Maxwell & Moore, Inc.
- Republic Flow Meters Company
- Taylor Instrument Companies

Samplers, Continuous
- Gilbert & Barker Mfg. Company
- McFarland Eng. & Pump Co.
- Taylor Instrument Companies

Switches, Control

FLOAT SWITCHES
- Fischer & Porter Company
- The Mercoid Corporation
- Square D Compnay
- Westinghouse Electric Corp.

LIMIT SWITCHES
- Atlas Valve Company
- Automatic Switch Company
- Cutler-Hammer, Inc.
- General Electric Company
- The Mercoid Corporation
- Square D Company
- Westinghouse Electric Corp.

MAGNETIC SWITCHES
- Jo-Bell Products, Inc.
- Square D Company
- Westinghouse Electric Corp.

PRESSURE SWITCHES
- Atlas Valve Company
- Barksdale Valves
- Cutler-Hammer, Inc.
- The Mercoid Corporation
- Minneapolis-Honeywell Reg. Co.
- Square D Company
- Westinghouse Electric Corp.

TEMPERATURE SWITCHES
- Atlas Valve Company
- Cutler-Hammer, Inc.
- Hagan Corporation
- The Mercoid Corporation
- Minneapolis-Honeywell Reg. Co.

TIMING SWITCHES
- Atlas Valve Company
- Automatic Switch Company
- General Electric Company
- The Mercoid Corporation
- Minneapolis-Honeywell Reg. Co.

VALVE CONTROL SWITCHES
- Atlas Valve Company
- Automatic Switch Company
- Cutler-Hammer, Inc.
- General Controls Company
- Minneapolis-Honeywell Reg. Co.

Tachometers
- The Bristol Company
- Potter Aeronautical Corp.
- Westinghouse Electric Corp.

Temperature Measurement

PYROMETERS, RADIATION
- Leeds & Northrup Company
- Pacific Transducer Corporation
- Pyrometer Instrument Company

PYROMETERS, OPTICAL
- Leeds & Northrup Company
- Pacific Transducer Corporation
- Pyrometer Instrument Company

THERMOCOUPLES
- The Bristol Company
- Condenser Service & Eng. Co.
- The Foxboro Company
- Leeds & Northrup Company
- Minneapolis-Honeywell Reg. Co.
- Pyrometer Instrument Company
- Victory Engineering Company
- West Instrument Corporation
- Westinghouse Electric Corp.
- Wheelco Instruments Division

THERMOMETERS, BIMETALLIC
- Assembly Products, Inc.
- Thomas A. Edison, Instr. Div.
- Electric Auto-Lite Company
- Fielden Instrument Division
- Leeds & Northrup Company
- Minneapolis-Honeywell Reg. Co.
- Pacific Transducer Corporation
- Weston Electrical Instr. Corp.

THERMOMETERS, RESISTANCE
- Thomas A. Edison Instr. Div.
- The Foxboro Company
- Leeds & Northrup Company
- Pacific Transducer Corporation
- Weston Electrical Instr. Corp.

THERMOMETERS, FILLED
- The Bristol Company
- Electric Auto-Lite Company
- Fischer & Porter Company
- The Foxboro Company
- ✔ Jas. P. Marsh Corporation
- Minneapolis-Honeywell Reg. Co.
- Norwood Controls, Unit of Detroit Controls
- Precision Therm. & Instr. Co.
- United States Gauge Division
- Weston Electric Instru. Corp.
- Taylor Instrument Companies

Transmitters

ELECTRIC TRANSMITTERS
- Automatic Switch Company
- Bailey Meter Company
- Black, Sivalls & Bryson, Inc.
- The Bristol Company
- Brookfield Eng. Labs, Inc.
- Builders-Providence, Inc.
- Conoflow Corporation
- Fielden Instrument Division
- Fischer & Porter Company
- The Foxboro Company
- Hagan Corporation
- Leeds & Northrup Company
- Minneapolis-Honeywell Reg. Co.
- Precision Therm. & Instr. Co.
- Republic Flow Meter Company
- Schutte & Koerting Company
- Shand & Jurs Company
- Taylor Instrument Companies

PNEUMATIC TRANSMITTERS
- Bailey Meter Company
- ✔ Barton Instrument Company
- Black, Sivalls & Bryson, Inc.
- The Bristol Company
- Brookfield Eng. Labs, Inc.
- Builders-Providence, Inc.
- Conoflow Corporation
- Fielden Instrument Division
- Fischer & Porter Company
- The Foxboro Company
- Hagan Corporation
- Leeds & Northrup Company
- Manning, Maxwell & Moore, Inc.
- Minneapolis-Honeywell Reg. Co.
- Republic Flow Meters Company
- Schutte & Koerting Company
- Shand & Jurs Company
- Taylor Instrument Companies
- United States Gauge Division

Timing Devices
- The Bristol Company
- Cutler-Hammer, Inc.
- The Foxboro Company
- General Electric Company
- Taylor Instrument Companies

Tubing, Instrument
- Samuel Moore & Company

Valve Positioners
- The Bristol Company
- Conoflow Corporation
- Cutler-Hammer, Inc.
- ✔ Fisher Governor Company
- The Foxboro Company
- Hagan Corporation
- Ledeen Mfg. Co.
- Leeds & Northrup Company
- Manning, Maxwell & Moore, Inc.
- Philadelphia Gear Works, Inc.
- Republic Flow Meters Company

Materials Handling Equipment

Conveyors
- Chain Belt Company
- Delta Tank Manufacturing Co.
- Fuller Company
- Link Belt Company
- Standard Conveyor Company

Conveyors—Parts

BELTING
- B. F. Goodrich Ind. Prod. Co.
- The Happy Company
- Link Belt Company
- United States Rubber Company

CHAIN
- Chain Belt Company
- Diamond Chain Company
- Dodge Manufacturing Corp.
- Link Belt Company

DRIVES
- Chain Belt Company
- Link Belt Company

SPROCKETS
- Chain Belt Company
- Diamond Chain Company
- Dodge Manufacturing Corp.
- Link Belt Company

Cranes

CLAM SHELLS AND DRAG LINES
- ✔ Koehring Company
- ✔ Schield Bantam Company

OVERHEAD CRANES
- Coffing Hoist Division
- Link Belt Company

SELF-PROPELLED CRANES
- ✔ Koehring Company
- Link Belt Company
- ✔ Schield Bantam Company

Hoists

CHAIN
- Coffing Hoist Division
- Shaw-Box Div., Manning, Maxwell & Moore, Inc.

ELECTRIC
- Coffing Hoist Division
- ✔ Ingersoll Rand Company
- Shaw-Box Division, Manning, Maxwell & Moore, Inc.

PNEUMATIC
- ✔ Ingersoll Rand Company
- Shaw-Box Division, Manning, Maxwell & Moore, Inc.

Loading Platforms and Racks
- Black, Sivalls & Bryson, Inc.
- Chikson Company
- ✔ National Tank Company

Shovels, Power
- Allis-Chalmers Mfg. Company
- ✔ Koehring Company
- Link Belt Company
- ✔ Schield Bantam Company

Tank Wagons
- ✔ J. B. Beaird Company
- Delta Tank Manufacturing Co.
- Patton Manufacturing Co., Inc.
- Gar Wood Industries, Inc.

Steel Buildings
- Columbian Steel Tank Company
- Dresser-Ideco

Tractors
- Allis-Chalmers Mfg. Company
- ✔ Caterpillar Tractor Company

Trenchers
- Cleveland Trencher Company
- ✔ Koehring Company (Parsons)
- ✔ Schield Bantam Company
- Gar Wood Industries, Inc.

Trucks and Carriers—Industrial
- Allis-Chalmers Mfg. Company
- Hyster Company

WINCHES
- Chicago Pneumatic Tool Co.
- Coffing Hoist Division
- Shand & Jurs Company
- Shaw-Box Div., Manning, Maxwell & Moore
- Gar Wood Industries, Inc.

Motors, Engines and Accessories

Accessories

ENGINE STARTERS
- Allis-Chalmers Mfg. Company
- The Happy Company
- Waukesha Sales & Service, Inc.

GEARS
- Allis-Chalmers Mfg. Company
- DeLaval Steam Turbine Co.
- Johnson Gear & Mfg. Company
- Link Belt Company
- Lufkin Foundry & Machine Co.
- Philadelphia Gear Works, Inc.
- Westinghouse Electric Corp.

PISTON RINGS—INDUST. ENGINES
- C. Lee Cook Company

SHEAVES
- Allis-Chalmers Mfg. Company
- Dayton Rubber Company
- Dodge Manufacturing Corp.
- ✔ The Gates Rubber Company
- The Happy Company
- Link Belt Company
- Reeves Pulley Company
- United States Rubber Company
- Worthington Corporation

SPARK PLUGS
- ✔ Stitt Ignition Company
- Waukesha Sales & Service, Inc.

V-BELTS
- Allis-Chalmers Mfg. Company
- Dayton Rubber Company
- Dodge Manufacturing Corp.
- ✔ The Gates Rubber Company
- B. F. Goodrich Ind. Prod. Co.
- The Happy Company
- Link Belt Company
- United States Rubber Company
- Waukesha Sales & Service, Inc.
- Worthington Corporation

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Diesel Engines
Alco Products, Inc.
Allis-Chalmers Mfg. Company
✔ Caterpillar Tractor Company
✔ Cooper-Bessemer
✔ Ingersoll Rand Company
Nordberg Manufacturing Co.
✔ Oil Well Supply Div., U S Steel
Waukesha Sales & Service, Inc.
✔ White Diesel Engines
Worthington Corporation
Chicago Pneumatic Tool Co.

Electric Motors
(Explosion and/or Splash Proof)
DIRECT CURRENT
Allis-Chalmers Mfg. Co.
General Electric Co.
Master Electric Co.
Peerless Electric Co.
Westinghouse Electric Corp.
INDUCTION AND SYNCHRONOUS
Allis-Chalmers Mfg. Co.
✔ Electric Machinery Mfg. Co.
General Electric Co.
Master Electric Co.
Peerless Electric Co.
Reliance Electric & Eng. Co.
Sterling Electric Motors, Inc.
U. S. Electrical Motors, Inc.
Westinghouse Electric Corp.
VARIABLE SPEED
Allis-Chalmers Mfg. Co.
General Electric Co.
Peerless Electric Co.
Sterling Electric Motors, Inc.
U. S. Electrical Motors, Inc.
Westinghouse Electric Corp.

Drive Components and Transmissions
BEARINGS
Chain Belt Co.
Dodge Manufacturing Corp.
Link Belt Co.
CLUTCHES
Dodge Manufacturing Co.
The Hilliard Corp.
Link Belt Co.
DRIVES - BELT
Allis-Chalmers Mfg. Co.
Link Belt Co.
Reeves Pulley Co.
Worthington Corp.
DRIVES - CHAIN
Chain Belt Co.
Dodge Manufacturing Corp.
Link Belt Co.
DRIVES - FLUID
American Blower Division
Dodge Manufacturing Corp.
Master Electric Company
DRIVES - GEARED
Allis-Chalmers Mfg. Co.
Johnson Gear & Mfg. Co.
Link Belt Co.
Lufkin Foundry & Machine
Philadelphia Gear Works, Inc.
Worthington Corp.
DRIVES - VARIABLE SPEED
Allis-Chalmers Mfg. Co.
Chain Belt Co.
Dodge Manufacturing Corp.
Link Belt Co.
Philadelphia Gear Works, Inc.
Reeves Pulley Co.
Sterling Electric Motors, Inc.
Westinghouse Electric Corp.
Worthington Corp.

Gas Engines
Allis-Chalmers Mfg. Co.
Chicago Pneumatic Tool Co.
✔ Cooper-Bessemer
✔ Ingersoll Rand Co.
Le Roi Div., Westinghouse Air Brake Co.
Lufkin Foundry & Machine Co.
Nordberg Manufacturing Co.
✔ Oil Well Supply Div., U.S. Steel
Waukesha Sales & Service, Inc.
✔ Wisconsin Motors Corp.
Worthington Corp.

Gas Turbines
Clark Brothers Co.
General Electric Co.
Westinghouse Electric Corp.

Gasoline Engines
Allis-Chalmers Mfg. Co.
Chicago Pneumatic Tool Co.
Le Roi Div, Westinghouse Air Brake Co.
Waukesha Sales & Service, Inc.
✔ Wisconsin Motors Corp.
Worthington Corp.

Steam Engines
✔ Ingersoll Rand Co.
Worthington Corp.

Steam Turbines
Allis-Chalmers Mfg. Co.
Dean Hill Pump Co.
DeLaval Steam Turbine Co.
General Electric Co.
Murray Iron Works Co.
Westinghouse Electric Corp.
L. J. Wing Mfg. Co.
Worthington Corp.

Pipe and Tubing

Flexible Hose
METAL
Aeroquip Corp.
Allied Metal Hose Co.
American Brass, Metal Hose Div.
Atlantic Metal Hose Co.
B. F. Goodrich Ind. Prod. Co.
Titeflex, Inc.
RUBBER
Aeroquip Corp.
Continental Rubber Works
B. F. Goodrich Ind. Prod. Co.
The Happy Co.
Hewitt-Robins, Inc.
United States Rubber Co.

Pipe
ALUMINUM
Harvey Aluminum Co.
A. B. Murray Co.
Revere Copper & Brass Co.
U. S. Steel Supply Division
ASBESTOS
Johns-Manville Corp.
COPPER AND COPPER ALLOY
✔ Ampco Metal, Inc.
Chase Brass & Copper Co.
Revere Copper & Brass Co.
CAST IRON
United States Pipe & Foundry
CERAMIC
United States Stoneware Co.
GLASS
Corning Glass Works
GRAPHITE
National Carbon Company
LEAD
Federated Metals Division
PLASTIC
Chicago Gasket Co.
Colonial Plastic Mfg. Co.
Corning Glass Works
✔ Kraloy Plastic Pipe Co.
National Tube Div., US Steel
Republic Steel Corp.
Jos. H. Ryerson & Sons, Inc.
Vanton Pump & Equipment Co.
STAINLESS STEELS
Alleghany Ludlum Steel Corp.
Babcock & Wilcox Co.
A. B. Murray Co., Inc.
Pacific Tube Co.
Republic Steel Corp.
Jos. H. Ryerson & Sons, Inc.
Standard Tube Co.
United States Pipe & Foundry
United States Steel Supply Div.
✔ Youngstown Sheet & Tube Co.
STEEL, LOW ALLOY
Alco Products, Inc.
Atlas Pipe, Inc.
Babcock & Wilcox Co.
Harvey Aluminum Co.
✔ Jones & Laughlin Steel Corp.
✔ Lone Star Steel Co.
A. B. Murray Co., Inc.
National Tube Div., US Steel
Naylor Pipe Co.
Pacific Tube Co.
Pittsburgh Steel Co.
Republic Steel Co.
Jos. H. Ryerson & Sons, Inc.
Standard Tube Co.
United States Pipe & Foundry Co.
United States Steel Supply Div.
✔ Youngstown Sheet & Tube Co.

Pipe Coils and Bends
Acme Coppersmithing & Mach.
Grinnell Co., Inc.
Midwest Piping Co., Inc.
Pressed Steel Co.
Vulcan-Cincinnati, Inc.
Whitlock Manufacturing Co.

Pipe Racks
Patton Manufacturing Co., Inc.

Prefabricated Pipe
Acme Coppersmithing & Mach.
Alco Products, Inc.
Atlas Pipe, Inc.
Crane Company
Fluor Products Co.
Grinnell Co., Inc.
M. W. Kellogg Co.
Midwest Piping Co., Inc.
Patton Manufacturing Co., Inc.
Pressed Steel Co.
Steel & Alloy Tank Co.
Vulcan-Cincinnati, Inc.
Whitlock Manufacturing Co.

Tubing
ALUMINUM
Harvey Aluminum Co.
A. B. Murray Co., Inc.
Revere Copper & Brass Co.
✔ Wolverine Tube
COPPER
American Brass Co.
Chase Brass & Copper Co.
Reading Tube Corporation
Revere Copper & Brass Co.
✔ Wolverine Tube
PLASTIC
Colonial Plastics Mfg. Co.
Corning Glass Works
Crane Co.
Durethene-Koppers Co.
Samuel Moore & Co.
Republic Steel Co.
Jos. H. Ryerson & Sons, Inc.
Saran Lined Pipe Co.
STAINLESS STEELS
Alleghany Ludlum Steel Corp.
American Brass Co.
A. B. Murray Co., Inc.
Pacific Tube Co.
Republic Steel Co.
Jos. H. Ryerson & Sons, Inc.
Standard Tube Co.
United States Pipe & Foundry Co.
✔ Youngstown Sheet & Tube Co.
STEEL, LOW ALLOY
Michigan Seamless Tube Co.
A. B. Murray Co., Inc.
National Tube Div., US Steel
Pacific Tube Co.
Pittsburgh Steel Co.
Pressed Steel Co.
Republic Steel Co.
Jos. H. Ryerson & Sons, Inc.
Standard Tube Co.
United States Pipe & Foundry Co.
✔ Youngstown Sheet & Tube Co.

Pipe Fittings, Valves Etc.

Filters, Cartridge
Alsop Engineering Corp.
V. D. Anderson Co.
Armstrong Machine Works
The Hilliard Corp.
Indiana Commercial Filters Corp.
Warner Lewis Corp.
FLANGES
Alco Products, Inc.
Babcock & Wilcox Co.
Daniel Orifice Fitting Co.
✔ Ladish Co.
Mack Iron Works Co.
Midwest Piping Co., Inc.
✔ Oil Well Supply Div., US Steel
✔ O.T.M. Corp.
Robinson Orifice Fittings Co.
Tube Turns, Div. Nat. Cyl. Gas
Worthington Corp.
Yale Sales Co.

Flexible Hose Fittings
Aeroquip Corp.
Allied Metal Hose Co.
American Brass, Metal Hose Div.
Atlantic Metal Hose Co.
Hewitt-Robins, Inc.
Imperial Brass Mfg. Co.
✔ National Tank Co.
Parker Appliance Co.
Scoville Manufacturing Co.
Titeflex, Inc.
Vanton Pump & Equipment Co.

Expansion Joints
Adsco Industries, Inc.
Aeroquip Corp.
Badger Manufacturing Co.
Dresser Mfg. Division
United States Rubber Co.
Yarnall-Waring Co.
Zallea Brothers

For additional information on products, services, and prices, use the enclosed Business Reply Cards.

Jacketed Fittings
Hetherington & Berner, Inc.

LP-Gas Systems
J. B. Beaird Co.
Delta Tank Mfg. Co.
McNamar Boiler & Tank Co.

Loading Arms and Assemblies
Chiksan Co.
Oil Equipment Mfg. Co.

Pipe Fittings
COMPRESSION
Dresser Mfg. Division
FLANGED
American Instrument Co.
Ampco Metal, Inc.
Grinnell Co., Inc.
Oil Well Supply Div., US Steel
O.T.M. Corp.
R P & C Valve Division
Henry Vogt Machine Co.
Walworth Co.
Worthington Corp.
PLASTIC FITTINGS
Colonial Plastic Mfg. Co.
Saran Lined Pipe Co.
Vanton Pump & Equipment Co.
SCREWED FITTINGS
American Instrument Co.
Ampco Metal, Inc.
Appleton Electric Co.
Clayton Mark & Co.
Dresser Mfg. Division
Grinnell Co., Inc.
Oil Well Supply Div., U S Steel
RP & C Division
Henry Vogt Machine Co.
Walworth Co.
Wheeling Machine Products Co.
W. S. Fittings, Inc.
WELDING FITTINGS
Alco Products, Inc.
Ampco Metal, Inc.
Babcock & Wilcox Co.
Clayton Mark & Co.
Ladish Co.
Midwest Piping Co., Inc.
W. C. Norris Manufacturer
Oil Well Supply Div., U S Steel
O.T.M. Corp.
Steel Forgings, Inc.
Tube Turns, Div. Natl. Cyl. Gas
Henry Vogt Machine Co.
Walworth Co.
Welding Fittings Corp.
W-K-M Div. of ACF Industries
W. S. Fittings, Inc.

Gaskets and Mechanical Packing
Belmont Packing & Rubber Co.
Chicago Gasket Co.
Chicago-Wilcox Mfg. Co.
C. Lee Cook Co.
Crane Packing Co.
Durametallic Corp.
Ernst Water Column Gage Co.
Flexitallic Gasket Co.
Johns-Manville Corp.
Metallo Gasket Co.
O.T.M. Corp.
Sterling Packing & Gasket Co.
United States Rubber Co.

Pulsation Dampeners
Allis-Chalmers Mfg. Co.
American Brass Co.
Fluor Products Co.

Prefabricated Pipe
See Pipe & Tubing Section

Repair Patches
Atlas Industries, Inc.
Dresser Mfg. Division

Sealing Compounds
Atlas Industries, Inc.
Atlas Mineral Products, Inc.
Johns-Manville Corp.
W-K-M Div. of ACF Industries

Slip Joints and Clamps
Atlas Industries, Inc.
Dresser Mfg. Division
M. B. Skinner Co.

Strainers Line
V. D. Anderson Co.
Armstrong Machine Works
Blackmer Pump Company
Black, Sivalls & Bryson, Inc.
Buffalo Meter Co.
Clark Manufacturing Co.
Clayton Mark & Co.
Durion Company, Inc.
Eclipse Fuel & Engineering Co.
Leslie Co.
The Lunkenheimer Co.
Mack Iron Works Co.
Multi-Metal Wire Cloth Co.
Newark Wire Cloth Co.
Sarco Co., Inc.
Schutte & Koerting Co.
Selas Corp. of America
Shand & Jurs Co.
A. O. Smith Corp.
Strong, Carlisle & Hammond Div.
Worthington Corp.
Yarnall-Waring Co.

Swing and Ball Joints
Barco Manufacturing Co.
Chiksan Co.
Oil Equipment Mfg. Co.
Sealol Corp.
Shand & Jurs Co.

Traps
AIR OR GAS TRAPS
V. D. Anderson Co.
Armstrong Machine Works
Buffalo Motor Co.
Cochrane Corp.
A. O. Smith Corp.
Strong, Carlisle & Hammond Div.
STEAM TRAPS
V. D. Anderson Co.
Armstrong Machine Works
Cochrane Corp.
Sarco Co., Inc.
Strong, Carlisle and Hammond
Yarnall-Waring Co.

Tubing Fittings
Chase Brass & Copper Co.
Imperial Mfg. Co.
Parker Appliance Co.

Unions
Blackmer Pump Co.
Catawissa Valve & Fittings Co.
Chapman Valve Mfg. Co.
Clayton Mark & Co.
The Guiberson Corp.
Ladish Co.
W. S. Fittings, Inc.

Valves
AUTOMATIC SHUTOFF VALVES
Automatic Switch Co.
Black, Sivalls & Bryson, Inc.
Kieley & Mueller Inc.
L-K Pump Valve Co.
The Lunkenheimer Co.
Oil Equipment Mfg. Co.
Schutte & Koerting Co.
BUTTERFLY VALVES
Allis-Chalmers Mfg. Co.
Crane Co.
Hagan Corp.
Hammell-Dahl Co.
The Lunkenheimer Co.
National Tank Co.
W. C. Norris Manufacturer
The Wm. Powell Co.
CHECK VALVES
Automatic Switch Co.
Catawissa Valve & Fittings Co.
Chapman Valve Mfg. Co.
Clayton Mark & Co.
Crane Co.
Daniel Orifice Fitting Co.
Edward Valves, Inc.
The Lunkenheimer Co.
The Ohio Injector Co.
Oil Well Supply Div., U S Steel
Penn. Pump & Compr. Co.
The Wm. Powell Co.
Schutte & Koerting Co.
Sealol Corp.
Shand & Jurs Co.
Worthington Corp.
CONTROL VALVES
Also See Instruments & Control Equipment Section
Aktomatic Valve Co., Inc.
Automatic Switch Co.
Barksdale Valves
Black, Sivalls & Bryson, Inc.
The Bristol Co.
Builders-Providence, Inc.
Conoflow Corp.
Equipment Engineers, Inc.
Fisher Governor Co.
Foster Engineering Co.
The Foxboro Co.
General Controls Co.
Hagan Corp.
Hammel-Dahl Co.
Hanna Engineering Works
Homestead Valve Mfg. Co.
Keiley & Mueller, Inc.
Ledeen Manufacturing Co.
Leslie Co.
The Lunkenheimer Co.
Manning, Maxwell & Moore, Inc.
Jas. P. Marsh Corp.
Mason-Neilan Regulator Co.
Republic Flow Meters Co.
Shand & Jurs Co.
A. O. Smith Corp.
Taylor Instrument Co.
Weston Electrical Instr. Corp.
DIAPHRAGM VALVES
American Instrument Co.
Automatic Switch Co.
Fisher Governor Co.
Grinnell Co., Inc.
Hammel-Dahl Co.
Hanna Engineering Works
Hills-McCanna Co.
Keiley & Mueller, Inc.
The Lunkenheimer Co.
Manning, Maxwell & Moore, Inc.
Schutte & Koerting Co.
FLOAT VALVES
Black, Sivalls & Bryson, Inc.
Fisher Governor Co.
Keiley & Mueller, Inc.
The Lunkenheimer Co.
National Tank Co.
Weston Electrical Instr. Corp.
GATE VALVES
Alco Products, Inc.
Allis-Chalmers Mfg. Co.
American Instrument Co.
Automatic Switch Co.
Barksdale Valves
Chapman Valve Mfg. Co.
Crane Co.
Durion Co., Inc.
Edward Valves, Inc.
Hamer Valves, Inc.
Hanna Engineering Works
Imperial Brass Mfg. Co.
The Lunkenheimer Company
Manning, Maxwell & Moore, Inc.
The Ohio Injector Co.
Oil Well Supply Div., U S Steel
Orbit Valve Co.
The Wm. Powell Co.
R P & C Valve Co.
Shand & Jurs Co.
Vernon Tool Co., Inc.
Henry Vogt Machine Co.
Walworth Co.
W-K-M Div. of ACF Industries
Worthington Corp.
GAGE AND INSTRUMENT VALVES
Crane Co.
Daniel Orifice Fitting Co.
Ernst Water Column & Gage Co.
Farris Engineering Co.
Jerguson Gage & Valve Co.
The Lunkenheimer Co.
The Wm. Powell Co.
GLOBE VALVES
American Instrument Co.
Automatic Switch Co.
Chapman Valve Mfg. Co.
Crane Co.
Edward Valves, Inc.
Imperial Brass Mfg. Co.
The Lunkenheimer Co.
The Ohio Injector Co.
Oil Well Supply Div., U S Steel
The Okadee Co.
The Wm. Powell Co.
R P & C Valve Division
Vernon Tool Co.
Henry Vogt Machine Co.
Walworth Co.
Yarnall-Waring Co.
LINE BLINDS
Homer Valves, Inc.
Mack Iron Works Co.
Robinson Orifice Fittings Co.
Yale Sales Co.
NEEDLE VALVES
Automatic Switch Co.
Chapman Valve Mfg. Co.
Hammel-Dahl Co.
Hoke, Inc.
Imperial Brass Mfg. Co.
The Lunkenheimer Co.
Jas. P. Marsh Corp.
The Wm. Powell Co.
PLASTIC VALVES
Automatic Switch Co.
Saran Lined Pipe Co.
PINCH VALVES
Farris Engineering Corp.
PLUG VALVES
Allis-Chalmers Mfg. Co.
American Instrument Co.
Automatic Switch Co.
DeZurik Corp.
Homer Valves, Inc.
Hammel-Dahl Co.
Homestead Valve Mfg. Co.
Ledeen Mfg. Co.
The Lunkenheimer Co.
The Wm. Powell Co.
Rockwell Mfg. Co.
Texsteam, Inc.
Vernon Tool Co.
W-K-M Div. of ACF Industries
PRESSURE REGULATORS
Atlas Valve Co.
Black, Sivalls & Bryson, Inc.
Clark Mfg. Co.
Eclipse Fuel Engineering Co.
Fisher Governor Co.
Foster Engineering Co.
Hammel-Dahl Co.
Hoke, Inc.
Keiley & Mueller, Inc.
Leslie Co.
L-K Pump Valve Co.
The Lunkenheimer Co.
Jas. P. Marsh Corp.
Mason-Neilan Regulator Co.
Rockwell Mfg. Co.

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Sarco Co., Inc.
Schutte & Koerting Co.
Strong, Carlisle & Hammond Div.
Yarnell-Waring Co.

SAFETY AND RELIEF VALVES
Automatic Switch Co.
Black, Sivalls & Bryson, Inc.
Cochrane Corp.
Crosby Steam Gage & Valve Co.
Eclipse Fuel Engineering Co.
Edward Valves, Inc.
Farris Engineering Corp.
Foster Engineering Corp.
Hungerford & Terry, Inc.
✔ The Lunkenheimer Co.
Manning, Maxwell & Moore, Inc.
Milton Roy Co.
Schutte & Koerting Co.
Shand & Jurs Co.
Statite Co.
Strong, Carlisle & Hammond Div.
Texsteam, Inc.
Yarnall-Waring Co.

TRICKLE VALVES
Ducon Co.

PLUG VALVE LUBRICATING EQUIP.
Delta Sales Engineering Co.
✔ The Wm. Powell Co.
Rockwell Mfg. Co.

Vaporizers—Ammonia, Propane, etc.
Richard M. Armstrong, Inc.
✔ J. B. Beaird Co.
✔ McNamar Boiler & Tank Co.

Process Equipment

Aerating Devices, Solids
Bin-Dicator Co.
Infilco, Inc.
Link Belt Co.

Autoclaves
Acme Coppersmithing & Mach.
American Instruments Co.
Condenser Service & Eng. Co.
Steel and Alloy Tank Co.
Struthers & Wells Corp.
Union Iron Works
Whitlock Mfg. Co.

Centrifuges
Condenser Service & Eng. Co.
DeLaval Steam Turbine Co.
Podbielniak, Inc.

Chemical Feeders
Allis-Chalmers Mfg. Co.
W. H. & L. D. Betz
B. F. Gump Co.
✔ D. H. Haering & Co.
Infilco, Inc.
Link Belt Co.
✔ Manzel, Div. of Houdaille Ind.
Omega Machine Co.
Milton Roy & Co.
Texsteam, Inc.

Clarifiers and Thickeners
Acme Coppersmithing and Machine Co.
Black, Sivalls and Bryson, Inc.
Chain Belt Co.
Cochrane Corp.
Door-Oliver, Inc.
Hardinge Co., Inc.
Infilco, Inc.
Link Belt Co.

Coalescers
ELECTRICAL
Howe-Baker Corp.
Petreco, Div. Petrolite Corp.
CARTRIDGE TYPE
Warner Lewis Co.

Cyclones and Dust Collectors
American Blower Division
Buell Engineering Co.
Ducon Co.
Dust Suppression and Eng. Co.
Green Fuel Economizer Co.
Hagan Corp.
Research Cottrell, Inc.
Schutte and Koerting Co.
Selas Corp. of America

Columns—Distillation, etc.
Acme Coppersmithing and Machine Co.
Adsco Industries, Inc.
Bethlehem Steel, Shipbldg Div.
✔ Chicago Bridge and Iron Co.
Columbian Steel Tank Co.
Combustion Engineering Co.
Delta Tank Mfg. Co.
Downingtown Iron Works
Fluor Products Co.
Fritz W. Glitsch & Sons, Inc.
Graver Tank and Mfg. Co.
✔ Hammond Iron Works
Haveg Corp.
C. M. Kemp Mfg. Co.
The Lummus Co.
✔ McNamar Boiler Tank Co.
Nooter Corp.
Pressed Steel Co.
A. O. Smith Corp.
Southwestern Engineering Co.
✔ Stearns-Roger Mfg. Co.
Steel and Alloy Tank Co.
Struthers Wells Corp.
✔ Sun Shpbldg & Drydock Co.
✔ Henry Vogt Machine Co.
Vulcan-Cincinnati, Inc.
Whitlock Mfg. Co.
✔ Wyatt Metal & Boiler Works

Desalters
ELECTRICAL
Howe-Baker Corp.
Petreco, Div. Petrolite Corp.
CHEMICAL
✔ National Tank Co.
✔ Tretolite, Div. Petrolite Corp.

Driers
INSTRUMENT AIR
✔ Pittsburgh Lectrodryer Co.
J. F. Pritchard & Co.
REGENERATIVE DESICCANT
C. M. Kemp Mfg. Co.
✔ Pittsburgh Lectrodryer Co.
ROTARY DRIER
Acme Coppersmithing & Machine Co.
Link Belt Co.
F. K. Stokes Corp.
SPRAY DRIERS
Acme Coppersmithing and Machine Co.
Condenser Service & Eng. Co.
Nichols Eng. & Research Co.
Foster D. Snell, Inc.
VACUUM DRIERS
Acme Coppersmithing and Machine Co.
Condenser Service & Eng. Co.
Paterson Foundry & Machine Co.
F. J. Stokes Corp.

Ejectors
STEAM JET
Degree Corp.
Penberthy Mfg. Co.
Ross Heat Exchanger Division
Schutte and Koerting Co.
Shand & Jurs Co.
Worthington Corp.
WATER JET
Penberthy Mfg. Co.
Ross Heat Exchanger Division
Schutte and Koerting Co.
Shand & Jurs Co.
Worthington Corp.

Evaporators
FLASH
Acme Coppersmithing and Machine Co.
Cleaver-Brooks Co.
✔ Goslin Birmingham Mfg. Co.
Stratford Engineering Corp.
Struthers Wells Corp.
MULTIPLE EFFECT EVAPORATORS
✔ Goslin-Birmingham Mfg. Co.
The Griscom-Russell Co.
The Lummus Co.
Struthers Wells Corp.

Filters
AIR FILTERS
Green Fuel Economizer Co.
✔ Pittsburgh Lectrodryer Co.
LEAF-TYPE FILTERS
Condenser Service & Eng. Co.
Door-Oliver, Inc.
✔ Goslin-Birmingham Mfg. Co.
Hercules Filter Co.
Infilco, Inc.
Sparkler Manufacturing Co.
LINE FILTERS & STRAINERS
See Pipe Fittings Section
PLATE AND FRAME FILTERS
Door-Oliver, Inc.
Independent Filter Press Co.
T. Shriver & Co., Inc.
Worthington Corp.
ROTARY VACUUM FILTERS
Door-Oliver, Inc.
✔ Goslin-Birmingham Mfg. Co.
T. Shriver & Co., Inc.
WATER FILTERS
See Water Treating Eqpt. Sec.

Gas Processing Equipment
DEHYDRATERS
✔ J. B. Beaird Co.
Black, Sivalls & Bryson, Inc.
Graff Engineering Corp.
✔ National Tank Co.
Oil Met. & Proc. Equip. Corp.
✔ Pittsburgh Lectrodryer Co.
✔ Stearns-Rogers Mfg. Co.
Stratford Engineering Corp.
Texsteam, Inc.
GAS PLANTS - PORTABLE
The Girdler Co.
Graff Engineering Co.
✔ National Tank Co.
✔ Stearns-Rogers Mfg. Co.
HYDROGEN SULFIDE REMOVAL UNITS
✔ J. B. Beaird Co.
The Girdler Co.
Graff Engineering Corp.
✔ National Tank Co.
REFRIGERATION SYSTEMS
Graff Engineering Corp.
✔ Stearns-Roger Mfg. Co.
SULFUR RECOVERY UNITS
The Girdler Co.
Graff Engineering Corp.
SCRUBBERS
Acme Coppersmithing and Machine Co.
Ducon Co.
Fluor Products Co.
Haveg Corp.
Haynes Stellite Co.

Grease Manufacturing Equipment
Paterson Foundry and Mach. Co.
Stratford Engineering Corp.

Inert Gas Generators
C. M. Kemp Manufacturing Co.

Injectors
Alco Products, Inc.
Penberthy Mfg. Co.
Texsteam, Inc.
Worthington Corp.

Mixers and Agitators
Alsop Engineering Corp.
Combustion Engineering Co.
Eastern Industries, Inc.
B. F. Gump Co.
Infilco, Inc.
International Engineering
Jensen Engineering Co.
Mixing Equip. Co., Inc.
Neptune Pump Mfg. Co.
New England Tank & Tower Co.
Paterson Foundry and Mach. Co.
Patton Manufacturing Co., Inc.
Philadelphia Gear Works, Inc.

Pressure Vessels
Acme Coppersmithing and Machine Co.
Adsco Industries, Inc.
V. D. Anderson Co.
Bethlehem Steel, Shipbldg. Div.
✔ Chicago Bridge and Iron Co.
Columbian Steel Tank Co.
Combustion Engineering Co.
Condenser Service & Eng. Co.
Delta Tank Manufacturing Co.
Dowingtown Iron Works
Fritz W. Glitsch & Sons, Inc.
✔ Graver Tank & Mfg. Co.
✔ Hammond Iron Works
Haveg Corp.
M. W. Kellogg Co.
The Lummus Co.
✔ McNamar Boiler and Tank Co.
✔ National Tank Co.
Nooter Corp.
Pressed Steel Co.
A. O. Smith Corp.
Southwestern Engineering Co.
✔ Stearns-Roger Mfg. Co.
Steel and Alloy Tank Co.
Struthers Wells Corp.
✔ Sun Shipbuilding & Dry Dock Co.
Union Iron Works
✔ Henry Vogt Machine Co.
Vulcan-Cincinnati, Inc.
Whitlock Manufacturing Co.
✔ Wyatt Metal & Boiler Works

Processing Equipment—Wooden
Arrow Tank Co., Inc.
Black, Sivalls and Bryson, Inc.
Fluor Products Co., Inc.
Woolford Wood Tank Co.

Pulverizers and Crushers
Allis-Chalmers Mfg. Co.
Combustion Engineering Co.
B. F. Gump Co.
Hardinge Co., Inc.
International Engineering
Paterson Foundry & Mach. Co.
Riley Stoker Corp.

Reactors, Stirred
Acme Coppersmithing and Machine Co.
American Instrument Co.
Stratford Engineering Corp.

Screening and Classification Equipment
Acme Coppersmithing & Machine Co.
Allis-Chalmers Mfg. Co.
American Instrument Co.
B. F. Gump Co.
Hardinge Co., Inc.
Link Belt Co.

For additional information on products, services, and prices, use the enclosed Business Reply Cards.

Paterson Foundry & Mach. Co.
Southwestern Engineering Co.

Separators

EMULSION OR WATER
✔ J. B. Beaird Co., Inc.
Black, Sivalls and Bryson, Inc.
Hendrick Mfg. Co.
✔ National Tank Co.
Oil Met. & Proc. Equip. Corp.
Schutte and Koerting Co.
Selas Corp. of America
Warner-Lewis Co.

LIQUID/GAS SEPARATORS
V. D. Anderson Co.
✔ J. B. Beaird Co., Inc.
Black, Sivalls and Bryson, Inc.
Combustion Engineering Co.
✔ National Tank Co.
Oil Met. & Proc. Equip. Corp.
Schutte and Koerting Co.
Selas Corp. of America
Tellepsen-Petrochem Constrs.
Texsteam, Inc.

MIST OR STEAM SEPARATORS
V. D. Anderson Co.
Black, Sivalls and Bryson, Inc.
Hagan Corp.
Schutte and Koerting Co.
Strong, Carlisle & Hammond Div.
Yarnall-Waring Co.
Otto H. York Co.

LIQUID CYCLONES
Equipment Engineers, Inc.
Selas Corp. of America

Tower Internals and Packings

BUBBLE CAPS
Fritz W. Glitsch & Sons, Inc.
✔ Koch Engineering Co.
Nutter Engineering Co.
Pressed Steel Co.
Vulcan-Cincinnati, Inc.

TRAYS
Acme Coppersmithing and Machine Co.
Fritz W. Glitsch & Sons, Inc.
Hendrick Manufacturing Co.
✔ Koch Engineering Co.
Nutter Engineering Co.
Vulcan-Cincinnati, Inc.

GRIDS
Hendrick Manufacturing Co.
✔ Irving Subway Grating Co.

PACKING - CERAMIC
Johns-Manville Corp.
Maurice A. Knight Co.
United States Stoneware Co.

PACKING - METAL
✔ Metallo Gasket Co.
Nooter Corp.

RISERS AND CHIMNEYS
Fritz W. Glitsch & Sons, Inc.
Hendrick Manufacturing Co.
✔ Koch Engineering Co.
Nutter Engineering Co.
Pressed Steel Co.
Vulcan-Cincinnati, Inc.

WIRE MESH DEMISTERS
Cambridge Wire Cloth Co.
Hendrick Manufacturing Co.
Multi-Metal Wire Cloth Co.
Otto H. York Co.

CATALYST SCREENS
Cambridge Wire Cloth Co.
✔ Irving Subway Grating Co.

Vacuum Systems and Equipment

Acme Coppersmithing & Machine Co.
✔ Ingersoll Rand Co.
Kinney Manufacturing Division
Oil Met. & Proc. Equip. Corp.
Schutte and Koerting Co.
F. J. Stokes Corp.
Whitlock Manufacturing Co.
Worthington Corp.

Wax Sweaters

Worthington Corp.

Pumps, Compressors, Fans and Blowers, Refrig. Equip.

Blowers

Allis-Chalmers Mfg. Co.
American Blower Division
Chelsea Fan & Blower Co.
Eclipse Fuel & Engineering Co.
Hartzell Fan & Blower Co.
✔ Ingersoll Rand Co.
Miehle-Dexter Supercharger
The Peerless Electric Co.
Roots-Connorville, Blower Div.

Compressors

CENTRIFUGAL TYPES
Allis-Chalmers Mfg. Co.
American Blower Division
Clark Brothers Co.
✔ Cooper-Bessemer
DeLaval Steam Turbine Co.
✔ Ingersoll Rand Co.
Roots-Connorville, Blower Div.
Spencer Turbine Co.
Worthington Corp.

PORTABLE COMPRESSORS
✔ J. B. Beaird Co.
Chicago Pneumatic Tool Co.
✔ Ingersoll Rand Co.
Le Roi Div., Westinghouse Air Brake Co.
Penna. Pump & Compressor Co.
Quincy Compressor Co.
Milton Roy Co.
Schramm, Inc.
Worthington Corp.

RECIPROCATING COMPRESSORS
✔ J. B. Beaird Co.
Clark Brothers Co.
✔ Cooper-Bessemer
✔ Ingersoll Rand Co.
✔ McNamar Boiler and Tank Co.
Penna. Pump & Compressor Co.
Quincy Compressor Co.
Milton Roy Co.
Schramm, Inc.
Worthington Corp.

ROTARY POSITIVE COMPRESSORS
Allis-Chalmers Mfg. Co.
Fuller Co.
Le Roi Div, Westinghouse Air Brake Co.
Roots-Connorville, Blower Div.

Fans

BOILER FORCED DRAFT
American Blower Division
Chelsea Fan and Blower Co.
Green Fuel Economiser Co.
Lau Blower Co.
L. J. Wing Mfg. Co.

COOLING TOWER FANS
American Blower Division
Hartzell Propeller Fan Co.
✔ Koppers Co., Fan Division

EXHAUST FANS
Chelsea Fan and Blower Co.
Hartzell Propeller Fan Co.
Lau Blower Co.
Mine Safety Appliances Co.
Peerless Electric Co.
L. J. Wing Mfg. Co.

Pumps

"CANNED" OR SEALED
Allis-Chalmers Mfg. Co.
Chem-Pump Corp.
✔ Ingersoll Rand Co.
Peerless Pump Division

CENTRIFUGAL PUMPS
Allis-Chalmers Mfg. Co.
American-Marsh Pumps, Inc.
✔ Ampco Metal, Inc.
Aurora Pump Division
✔ Byron Jackson Pumps, Inc.
Carver Pump Co.
Dean Brothers Pumps, Inc.
Dean Hill Pump Co.
DeLaval Steam Turbine Co.
Deming Co.
Durion Co., Inc.
Eastern Industries, Inc.
✔ Eco Engineering Co.
Goulds Pumps, Inc.
✔ Ingersoll Rand Co.
Johnston Pump Co.
Lawrence Pumps, Inc.
Layne & Bowler Pump Co.
Marlow Pumps, Div. of Bell & Gossett
✔ Oil Well Supply Div., U. S. Steel
Pacific Pumps, Inc.
Peerless Pump Division
Penna. Pump & Compressor Co.
Vanton Pump & Equipment Co.
Warren Pumps, Inc.
Worthington Corp.

DEEP WELL PUMPS
✔ Byron Jackson Pumps, Inc.
Layne & Bowler, Inc.
Layne & Bowler Pump Co.

SLURRY PUMPS
Chicago Pneumatic Tool Co.
Dorr-Oliver, Inc.
The Girdler Co.
✔ Manzel, Div. Houdaille Ind.
Marlow Pumps, Div. Bell Gossett
T. Shriver & Co., Inc.
Worthington Corp.

FUEL OIL PUMPS
Eastern Industries, Inc.
Eclipse Fuel & Engineering Co.
The Engineer Co.
Iron Fireman Mfg. Co.
Layne & Bowler Pump Co.
Ray Oil Burner Co.

HYDRAULIC PUMPS
Aldrich Pump Co.
Eastern Industries, Inc.
Ledeen Mfg. Co.

MECHANICAL SEALS
✔ Byron Jackson Pumps, Inc.
Crane Packing Co.
✔ Durametallic Corp.
Sealol Corp.

PORTABLE PUMPS
Carver Pump Co.
Homelite, Div. of Textron
✔ Ingersoll Rand Co.
Worthington Corp.

PROPORTIONING AND METERING PUMPS
American Instrument Co.
W. H. & L. D. Betz
Clarkson Co.
Hills-McCanna Co.
Infilco, Inc.
Lapp Insulator Co.
McFarland Eng. & Pump Co.
✔ Manzel, Div. of Houdaille Ind.
Neptune Pump Mfg. Co.
Proportioneers, Inc.
Milton Roy Co.
T. Shriver & Co., Inc.
Texsteam, Inc.

RECIPROCATING PUMPS
Aldrich Pump Co.
American-Marsh Pumps, Inc.
Dean Brothers Pumps, Inc.
Deming Co.
✔ Ingersoll Rand Co.
Marlow Pumps, Div. Bell & Gossett
Neptune Pump Mfg. Co.
✔ Oil Well Supply Div., U. S. Steel
Warren Pumps, Inc.
Worthington Corp.

ROTARY POSITIVE PUMPS
Carver Pump Co.
DeLaval Steam Turbine Co.
Eastern Industries, Inc.
✔ Eco Engineering Co.
Kinney Manufacturing Division
Schutte & Koerting Co.
Sier-Bath Gear and Pump Co.
Viking Pump Co.
Warren Pumps, Inc.
Worthington Corp.

SCREW PUMPS
Blackmer Pump Co.
T. Shriver & Co.
Sier-Bath Gear and Pump Co.
Warren Pumps, Inc.

SUMP PUMPS
Chicago Pneumatic Tool Co.
✔ Ingersoll Rand Co.
Neptune Pump Mfg. Co.
Penberthy Mfg. Co.
Worthington Corp.

TUBING PUMPS
Sigamotor, Inc.

TURBINE PUMPS
Allis-Chalmers Mfg. Co.
American-Marsh Pumps, Inc.
Aurora Pump Division
DeLaval Steam Turbine Co.
Layne & Bowler, Inc.
Worthington Corp.

VACUUM PUMPS
Allis-Chalmers Mfg. Co.
Chicago Pneumatic Tool Co.
✔ Ingersoll Rand Co.
National Research Corp.
Penna. Pump & Compressor Co.
Roots-Connorville, Blower Div.
Sarco Company, Inc.
Schutte & Koerting Co.
F. J. Stokes Corp.
Worthington Corp.

Refrigeration Units, Industrial

GAS COMPRESSION
American Blower Division
General Electric Co.
✔ Ingersoll Rand Co.
✔ Henry Vogt Machine Co.
Worthington Corp.

STEAM JET
✔ Ingersoll Rand Co.
The Lummus Co.
Schutte & Koerting Co.
Worthington Corp.

✔Advertisement in this issue, index is on page A-6.

Safety and Fire Protection Equipment

Alarms, Fire and Temperature
Thomas A. Edison, Inc.
Walter Kidde & Co., Inc.

Alarms, Smoke
Walter Kidde & Co., Inc.

Fire Fighting Equipment

EXTINGUISHERS
American LaFrance Corp.
Walter Kidde & Co., Inc.

FOAM TOWERS AND SYSTEMS
American LaFrance Corp.
Central Safety Equipment Co.
Grinnell Co., Inc.
Walter Kidde & Co., Inc.

FIRE HOSE
American LaFrance Corp.
B. F. Goodrich Ind. Prod. Co.
Hewett-Robins, Inc.
United States Rubber Co.

NOZZLES
American LaFrance Corp.
Central Safety Equipment Co.

SPRINKLER SYSTEMS
Central Safety Equipment Co.
Grinnell Co., Inc.
Walter Kidde & Co., Inc.

MONITORS
American LaFrance Corp.
Chiksan Co.

Safety Equipment and Supplies

BREATHING APPARATUS
American LaFrance Corp.
Mine Safety Appliances Co.

FACE SHIELDS
American Optical Co.
Central Safety Equipment Co.
Mine Safety Appliance Co.
United States Safety Service Co.

GOGGLES
American Optical Co.
Bausch & Lomb Optical Co.
Central Safety Equipment Co.
Mine Safety Appliances Co.
United States Safety Service Co.

HELMETS
American Optical Co.
Central Safety Equipment Co.
Mine Safety Appliances Co.
United States Safety Service Co.

PROTECTIVE CLOTHING
American Optical Company
Central Safety Equipment Co.
B. F. Goodrich Ind. Prod. Co.
Mine Safety Appliances Co.
United States Safety Service Co.

Storage Tanks and Accessories

Storage Tanks

CONE ROOF TANKS
✔ J. B. Beaird Co., Inc.
Black, Sivalls and Bryson, Inc.
✔ Chicago Bridge and Iron Co.
Columbian Steel Tank Co.
✔ Graver Tank and Mfg. Co.
✔ Hammond Iron Works
✔ National Tank Co.
Nooter Corp.
Whitlock Mfg. Co.

FLOATING ROOF TANKS
Black, Sivalls and Bryson, Inc.
✔ Chicago Bridge and Iron Co.
✔ Graver Tank and Mfg. Co.
✔ Hammond Iron Works
Nooter Corp.

LPG AND AMMONIA TANKS
✔ J. B. Beaird Co., Inc.
✔ Chicago Bridge and Iron Co.
Delta Tank Mfg. Co.
✔ McNamar Boiler & Tank Co.
Nooter Corp.
Steel and Alloy Tank Co.
✔ Wyatt Metal & Boiler Works

SPHERES AND SPHEROIDS
✔ Chicago Bridge and Iron Co.
✔ Graver Tank and Mfg. Co.
✔ Hammond Iron Works

VAPOR DOME TANKS
✔ Chicago Bridge and Iron Co.
✔ Graver Tank and Mfg. Co.
✔ Hammond Iron Works

WATER TANKS
✔ Chicago Bridge & Iron Co.
Columbian Steel Tank Co.
✔ Graver Tank and Mfg. Co.
✔ Hammond Iron Works

WOOD TANKS
Arrow Tank Company, Inc.
Black, Sivalls and Bryson, Inc.
Fluor Products Co.
✔ National Tank Co.
Woolford Wood Tank Co.

BOLTED TANKS
Black, Sivalls & Bryson, Inc.
Columbian Steel Tank Co.
✔ National Tank Co.
Whitlock Mfg. Co.

ACID TANKS
Maurice A. Knight Co.
Patton Mfg. Co., Inc.
United States Stoneware Co.

Tank Accessories

BREATHERS AND VENT VALVES
Black, Sivalls and Bryson, Inc.
✔ Pittsburgh Lectrodryer Co.
Shand and Jurs Co.
Statite Co.

DRAIN VALVES
Black, Sivalls and Bryson, Inc.
Shand and Jurs Co.

FLAME ARRESTORS
Black, Sivalls and Bryson, Inc.
C. M. Kemp Mfg. Co.
Shand and Jurs Co.
Statite Co.

GAGES—ELECTRONIC
Fielden Instrument Division
Gilbert and Barker Mfg. Co.
Texas Instruments, Inc.

GAGES—FLOAT
King Engineering Co.
Shand and Jurs Co.
Statite Co.

NOZZLES
Shand and Jurs Co.
Statite Co.

TANK RELIEF VALVES
Black, Sivalls and Bryson, Inc.
Shand and Jurs Co.
Statite Co.

Tools, Welding Equipment, and Pipe Machinery

Cleaning Units

HEAT EXCHANGER
The Airetool Mfg. Co.
Chicago Pneumatic Tool Co.
Koppers Co., Inc.

TUBE, FURNACE
The Airetool Mfg. Co.
Chicago Pneumatic Tool Co.
Homestead Valve Mfg. Co.
Worthington Corp.

VACUUM, INDUSTRIAL
Spencer Turbine Co.

Guns, Concrete
True Gum-All Equipment Co.

Lubricating Equipment

FORCED FEED LUBRICATORS
Lincoln Engineering Co.
✔ The Lunkenheimer Co.
✔ Manzel, Div. of Houdaille Ind.

HOSE AND ACCESSORIES
Delta Engineering Sales Co.
Lincoln Engineering Co.
✔ The Lunkenheimer Co.
✔ The Wm. Powell Mfg. Co.

PLUG VALVE LUBRICATORS
Delta Engineering Sales Co.
Lincoln Engineering Co.
✔ The Lunkenheimer Co.
✔ The Wm. Powell Mfg. Co.
Rockwell Mfg. Co.

Oil Seal Pullers
Patton Mfg. Co., Inc.

Pipe Machinery

BENDING
✔ Ridge Tool Co.
Toledo Pipe Threading Mach. Co.

CUTTING AND THREADING
Beaver Pipe Tools, Inc.
Oster Mfg. Co.
✔ Ridge Tool Co.
Toledo Pipe Threading Mach. Co.

PIPE WRENCHES
✔ Ampco Metal, Inc.
Chicago Pneumatic Tool Co.
Gearench Mfg. Co.
✔ Ridge Tool Co.
Toledo Pipe Threading Mach. Co.
Worthington Corp.

Pneumatic Tools
Chicago Pneumatic Tool Co.
✔ Ingersoll Rand Co.
Le Roi Div, Westinghouse Air Brake Co.
Worthington Corp.

Tube Benders
Imperial Brass Mfg. Co.
Parker Appliance Co.

Tube Expanders
Airetool Mfg. Co.
Chicago Pneumatic Tool Co.
Imperial Brass Mfg. Co.
Parker Appliance Co.
Vernon Tool Co.
Gustav Wiedeke Co.

Tubing Cutters and Flaring Tools
Airetool Mfg. Co.
Imperial Brass Mfg. Co.
Parker Appliance Co.
✔ Ridge Tool Co.
Gustav Wiedeke Co.

Welding Equipment and Supplies

ARC WELDING SUPPLIES
General Electric Company
Hobart Brothers Co.
Raytheon Manufacturing Co.
Westinghouse Electric Corp.

AUTO-CUTTING TORCHES
Air Reduction Co.
Linde Air Products Co.
Vernon Tool Co.
Worthington Corp.

CUTTING TORCHES
Air Reduction Co.
Linde Air Products Co.
Vernon Tool Co.

ELECTRODES
Arcos Corp.
General Electric Co.
Haynes Stellite Co.
Hobart Brothers Co.
International Nickel Co.
Wall Colmonoy Co.

HOSE
Air Reduction Co.
Linde Air Products Co.
United States Rubber Co.

PIPE SADDLES
M. B. Skinner Co.
Steel Forgings, Inc.

PRESSURE REGULATORS
Air Reduction Co.
Linde Air Products Co.
The Matheson Co.

SPRAYS—METALLIZING
Wall Colmonoy Co.

WELDERS—ELECTRIC
General Electric Co.
Hobart Brothers Co.
Miller Electric Mfg. Co.
Westinghouse Electric Corp.

WELDING ROD
Arcos Corporation
American Brass Co.
✔ Ampco Metals, Inc.
Haynes Stellite Co.
International Nickel Co.
Linde Air Products Co.
Wall Colmonoy Co.

FLUX
International Nickel Co.
Linde Air Products Co.
Wall Colmonoy Co.

GASES, COMPRESSED
Air Reduction Co.
Linde Air Products Co.
The Matheson Co.

Water Treating Equipment and Chemicals

Chemicals

ION EXCHANGE RESINS
Allis-Chalmers Mfg. Co.
Chemical Process Co.
Hagan Corp. (Calgon)

ANTIFOAMING AGENTS
Allis-Chalmers Mfg. Co.
Aquatrol, Inc.
Hagan Corporation (Calgon)

BOILER FEEDWATER TREATING
Aquatrol, Inc.
W. H. & L. D. Betz
Hagan Corp. (Calgon)
National Aluminate Corp.

For additional information on products, services, and prices, use the enclosed Business Reply Cards.

ZEOLITES
- Allis-Chalmers Mfg. Co.
- W. H. & L. D. Betz
- Hagan Corp. (Calgon)
- Hungerford & Terry, Inc.

Chemical Feeders
- See Processing Equipment Sect.

Chlorinators
- Builders-Providence, Inc.
- Fischer and Porter Co.

Clarifiers
- Acme Coppersmithing & Mach.
- Black, Sivalls and Bryson, Inc.
- Chain Belt Co.
- Cochrane Corp.
- Dorr-Oliver, Inc.
- Graver Water Conditioning
- Hardinge Co., Inc.
- Infilco, Inc.
- Link Belt Co.
- The Permutit Co.

Filters
- Acme Coppersmithing & Mach.
- Allis-Chalmers Mfg. Co.
- Black, Sivalls and Bryson, Inc.
- Cochrane Corp.
- Dorr-Oliver, Inc.
- Graver Water Conditioning Co.
- Hardinge Co., Inc.
- Hungerford & Terry, Inc.
- Infilco, Inc.
- The Permutit Co.
- Sparkler Mfg. Co.
- Worthington Corp.

Deaerators
- Acme Coppersmithing & Mach.
- Allis-Chalmers Mfg. Co.
- Cochrane Corp.
- The Permutit Co.
- Worthington Corp.

Water Softening Units
(All Types)
- Allis-Chalmers Mfg. Co.
- Cochrane Corp.
- Graver Water Conditioning Co.
- Hungerford and Terry, Inc.
- Infilco, Inc.
- The Permutit Co.

Separators and Skimmers for Waste Water
- Black, Sivalls and Bryson, Inc.
- Chain Belt Co.
- Dorr-Oliver, Inc.
- Graver Water Conditioning Co.
- Hardinge Co., Inc.
- Infilco, Inc.

Chemicals and Catalysts

Acid Inhibitors
- ✔ E. I. Du Pont, Grasselli Div.
- ✔ Humble Oil & Refining Co.

Acids

ACETIC ACID
- Carbide & Carbon Chemicals Co.
- Eastman Chemical Products, Inc.
- Koppers Co.

CRESYLIC ACID
- Jefferson Lake Chemical Co.
- Koppers Chemical Co.
- Pitt-Consol Chemical Co.

FATTY ACIDS
- Emery Industries, Inc.

HYDROCHLORIC ACID
- Consolidated Chem. Industries
- ✔ Davison Chemical Co.
- Diamond Alkali Co.
- ✔ Harshaw Chemical Co.
- Olin Mathieson Chemical Corp.
- Pennsylvania Salt Mfg. Co.
- Stauffer Chemical Co.
- Wyandotte Chemicals Corp.

HYDROFLUORIC ACID
- ✔ Harshaw Chemical Co.
- Pennsylvania Salt Mfg. Co.
- Stauffer Chemical Co.

NITRIC ACID
- Consolidated Chemical Ind.
- ✔ Davison Chemical Co.
- Escambia Chemical Corp.
- Lion Oil Co.
- Olin Mathieson Chemical Co.
- Stauffer Chemical Co.

SULFURIC ACID
- Consolidated Chemical Ind.
- ✔ Davison Chemical Co.
- ✔ E. I. Du Pont, Grasselli Div.
- Olin Mathieson Chemical Corp.
- Pennsylvania Salt Mfg. Co.
- Stauffer Chemical Co.
- U. S. Industrial Chemicals Co.

Activated Carbon
- Carbide & Carbon Chemicals Co.
- Great Lakes Carbon Corp.
- National Carbon Co.

Additives

ASPHALT
- General Electric Co.
- ✔ Tretolite, Div. Petrolite Corp.

FUEL OIL ANTIOXIDANTS
- American Cyanamid Co.
- Catalin Corp. of America
- ✔ E. I. Du Pont, Pet. Chem. Div.
- National Aluminate Corp.
- ✔ Tretolite, Div. Petrolite Corp.
- ✔ Universal Oil Products Co.

GASOLINE ANTIOXIDANTS
- American Cyanamid Co.
- Catalin Corp. of America
- ✔ E. I. Du Pont, Pet. Chem. Div.
- Eastman Chemical Products, Inc.
- Koppers Co.
- National Aluminate Corp.
- ✔ Universal Oil Products Co.

GASOLINE METAL DEACTIVATOR
- ✔ E. I. Du Pont, Pet. Chem. Div.
- ✔ Tretolite, Div. Petrolite Corp.
- ✔ Universal Oil Products Co.

GAS ODORANTS
- Natural Gas Odorizing Div.
- Pennsylvania Salt Mfg. Co.

LUBRICATING OIL
- American Cyanamid Co.
- ✔ E. I. Du Pont, Grasselli Div.
- Enjay Co., Inc.

REODORANTS
- Rhodia, Inc.

TETRAETHYL LEAD
- ✔ E. I. Du Pont, Pet. Chem. Div.
- ✔ Ethyl Corp.

Adhesives
- Carbide & Carbon Chemicals Co.
- Chemical Process Co.
- Consolidated Chemical Ind.
- Dow Corning Corp.
- Enjay Co., Inc.
- General Electric Corp.

Alcohols
- Air Reduction Chemical Co.
- Carbide & Carbon Chemicals Co.
- ✔ E. I. Du Pont, Pet. Chem. Div.
- Eastman Chemical Products, Inc.
- Enjay Co., Inc.
- Olin Mathieson Chemical Corp.
- Pennsylvania Salt Mfg. Co.
- U. S. Industrial Chemicals Co.

Aldehydes
- Carbide & Carbon Chemicals Co.
- Olin Mathieson Chemical Corp.
- Solvay Process Division
- U. S. Industrial Chemicals Co.

Amines
- Carbide & Carbon Chemical Co.
- Olin Mathieson Chemical Corp.

Ammonia
- ✔ E. I. Du Pont, Grasselli Div.
- Escambia Chemical Corp.
- Lion Oil Co.
- Olin Mathieson Chemical Corp.
- Pennsylvania Salt Mfg. Co.
- Solvay Process Division
- U. S. Industrial Chemicals Co.

Antifoaming Agents
- Air Reduction Chemical Co.
- Dow Corning Corp.
- General Electric Co.
- Hagan Corp.
- Ohio-Apex Division

Catalysts

CATALYST CARRIERS
- Aluminum Co. of America
- Carbide & Carbon Chemicals Co.
- Harshaw Chemical Co.
- Minerals & Chem. Corp. of Amer.

CATALYTIC CRACKING
- American Cyanamid Co.
- ✔ Davison Chemical Co.
- Filtrol Corp.
- Houdry Process Co.
- Minerals & Chem. Corp. of Amer.
- Socony Mobil Oil Co.

CATALYTIC POLYMERIZATION
- ✔ Universal Oil Products Co.

CATALYTIC REFORMING
- American Cyanamid Co.
- ✔ Davison Chemical Co.
- The Girdler Co.
- ✔ Harshaw Chemical Co.
- Houdry Process Co.
- Socony Mobil Oil Co.
- ✔ Universal Oil Products Co.

DEHYDROGENATION
- ✔ Harshaw Chemical Co.
- Houdry Process Co.

DEOXIDATION
- The Girdler Co.

DESULFURIZATION
- American Cyanamid Co.
- The Girdler Co.
- ✔ Harshaw Chemical Co.
- Houdry Process Co.

GAS REFORMING
- American Cyanamid Co.
- The Girdler Co.
- ✔ Harshaw Chemical Co.

HYDROGENATION
- The Girdler Co.
- ✔ Harshaw Chemical Co.
- Houdry Process Co.
- ✔ Universal Oil Products Co.

ISOMERIZATION
- American Cyanamid Co.
- ✔ Davison Chemical Co.
- The Girdler Co.
- M. W. Kellogg Co.
- ✔ Universal Oil Products Co.

Chlorinated Hydrocarbons
- Bakelite Co.
- Carbide & Carbon Chem. Co.
- Olin Mathieson Chemical Corp.
- Solvay Process Division
- Stauffer Chemical Co.
- Wyandotte Chemicals Corp.

Chlorine
- Diamond Alkali Co.
- Hooker Electro Chemical Co.
- Olin Mathieson Chemical Corp.
- Pennsylvania Salt Mfg. Co.
- Stauffer Chemical Co.
- U. S. Industrial Chemicals Co.
- Wyandotte Chemicals Corp.

Clays and Earths
- Filtrol Corp.
- Floridin Co.
- Magnet Cove Barium Corp.
- Minerals & Chem. Corp. of Am.
- Stauffer Chemical Co.

CORROSION INHIBITORS
- ✔ E. I. Du Pont, Grasselli Div.
- Hagan Corp.
- ✔ Humble Oil & Refining Co.
- National Aluminate Corp.
- ✔ Tretolite, Div. Petrolite Corp.
- ✔ Universal Oil Products Co.

Custom Chemicals
- Anderson Chemical Co.
- J. T. Baker Chemical Co.

Demulsifiers
- ✔ Humble Oil & Refining Co.
- ✔ Tretolite, Div. Petrolite Corp.
- ✔ Visco Products Co.

Desalting Chemicals
- ✔ Humble Oil & Refining Co.
- ✔ Tretolite, Div. Petrolite Corp.

Detergents & Cleaning Compounds
- Air Reduction Chemical Co.
- Carbide & Carbon Chemical Co.
- Diamond Alkali Chem. Co.
- Hagan Corp. (Calgon)
- Magnus Chemical Co., Inc.
- Oaklite Products, Inc.
- Solvay Process Division
- Wyandotte Chemicals Corp.

Filtering Aids
- Dicalite Div. Gr. Lakes Chm. Corp.
- Floridin Co.
- Minerals & Chem. Corp. of Am.

Fluorine Compounds
- Bakelite Co.
- Carbide & Carbon Chemicals Co.
- ✔ Harshaw Chemical Co.

Ethers
- Carbide & Carbon Chemicals Co.
- U. S. Industrial Chemicals Co.
- Wyandotte Chemicals Corp.

Furfural
- Quaker Oats Company

Esters
- Eastman Chemical Products Co.
- Emery Industries, Inc.
- Enjay Co., Inc.
- U. S. Industrial Chemicals Co.

Glycols and Glycerine
- Carbide & Carbon Chem. Co.
- ✔ E. I. Du Pont, Polychem. Dept.
- Olin Mathieson Chemical Corp.
- Wyandotte Chemicals Corp.

Hydroxides

CALCIUM HYDROXIDE
- Linde Air Products Co.

BARIUM HYDROXIDE
- American Potash & Chem. Corp.

POTASSIUM HYDROXIDE
- Hooker Electro Chemical Co.
- Pennsylvania Salt Mfg. Co.
- Solvay Process Division

SODIUM HYDROXIDE
- Diamond Alkali Co.
- Olin Mathieson Chemical Co.
- Pennsylvania Salt Mfg. Co.
- Solvay Process Division
- Stauffer Chemical Co.
- U. S. Industrial Chemicals Co.
- Wyandotte Chemicals Co.

Ketones
- Carbide & Carbon Chemicals Co.
- Eastman Chemical Products, Inc.

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Enjay Co., Inc.
U. S. Industrial Chemicals Co.

Nitrogen
Air Reduction Co.
Linde Air Products Co.
The Matheson Co.

Metallo-Organic Compounds
Anderson Chemical Co.
✔ Harshaw Chemical Co.

Oxygen
Air Reduction Co.
Linde Air Products Co.
The Matheson Co.

Phenol
Carbide & Carbon Chem. Co.
Koppers Co.
Pitt-Consol Chemical Co.

Plasticizers
Carbide & Carbon Chem. Co.
Chemical Process Co.
Emery Industries, Inc.
Ohio-Apex Division
Thiokol Chemical Co.

Plastics and Rubber
Air Reduction Chemical Co.
Bakelite Co.
Carbide & Carbon Chem. Co.
Chemical Process Co.
Dow Corning Corp.
E. I. Du Pont, Polychem. Dept.
Enjay Co., Inc.
Escambia Chemical Corp.
Gates Engineering Co.
General Tire & Rubber Co.
B. F. Goodrich Chemical Co.
✔ Humble Oil & Refining Co.
Pitt-Consol Chemical Co.
Solvay Process Division
Thiokol Chemical Corp.
U. S. Industrial Chemicals Co.
United States Rubber Co.

Paraffin Control Chemicals
✔ Brakesol, Inc.
✔ Humble Oil & Refining Co.

Radiochemicals
✔ Isotopes Specialties Co.
Tracerlab, Inc.

Salts, Inorganic
American Cyanamid Co.
American Potash & Chem. Corp.
Consolidated Chemical Ind.
Diamond Alkali Co.
Hooker Electro Chemical Co.
International Salt Co.
Ohio-Apex Division
Olin Mathieson Chemical Corp.
Pennsylvania Salt Mfg. Co.
Solvay Process Division
Stauffer Chemical Co.
✔ Tennessee Corp.
Wyandotte Chemicals Corp.

Sulfur
Consolidated Chemical Ind.
Freeport Sulfur Co.
General Tire & Rubber Co.
Jefferson Lake Chemical Co.
Olin Mathieson Chemical Corp.
Solvay Process Division
Stauffer Chemical Co.

Laboratory Equipment & Supplies

Analytical Instruments

AUTOMATIC TITRATION
✔ Beckman Instruments, Inc.
✔ Central Scientific Co.

CHROMOTOGRAPHERS
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✔ Beckman Instruments, Inc.
Hallikainen Instruments
Mine Safety Appliances Co.
Perkin-Elmer Corp.

COLORIMETERS
Bausch & Lomb Optical Co.
✔ Beckman Instruments, Inc.
Hagan Corp.
Hallikainen Instruments
Leeds & Northrup Co.
Manufacturers Eng. & Equip.
Weston Electrical Inst. Co.

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Hagan Corp.
Leeds & Northrup Co.

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Laboratory Equipment Co.

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Moisture Register Co.

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✔ Analytical Measurements, Inc.
✔ Beckman Instruments, Inc.
Hallikainen Instruments
Leeds & Northrup Co.
Scientific Glass Apparatus Co.
Weston Electric Instr. Corp.

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Bausch & Lomb Optical Co.
Manufacturers Eng. & Equip.
Perkin-Elmer Corp.

RADIOLOGICAL MEASUREMENT
Baird-Atomic, Inc.
Hallikainen Instruments
Radiation Counters Labs
Tracerlab, Inc.

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Baird-Atomic, Inc.
✔ Beckman Instruments, Inc.
✔ Consolidated Electrodynamics
Hallikainen Instruments
Jarrel-Ash Co.
Leeds & Northrup Co.
Perkin-Elmer Corp.
Process & Instruments, Inc.
Scientific Glass Apparatus Co.

SULFUR CONTENT
✔ Central Scientific Co.
Laboratory Equipment Co.

VAPOR PRESSURE
✔ Central Scientific Co.

VISCOMETERS
American Instrument Co.
Brookfield Engineering Labs
Hagan Corp.
Hallikainen Instruments

WATER ANALYZERS—ELECTROLYTIC
Manufacturers Eng. & Equip.

Analytical Reagents
J. F. Baker Chemical Co.
Fisher Scientific Co.
Hagan Corporation (Hall Labs)
Mallinkrodt Chemical Works
Scientific Glass Apparatus Co.

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✔ Central Scientific Co.
W. H. Curtin & Co.
Fisher Scientific Co.
The Refinery Supply Co.
Scientific Glass Apparatus Co.

Glassware
✔ Central Scientific Co.
Corning Glass Works
Fischer & Porter Co.
Laboratory Glass & Inst. Corp.
Scientific Glass Apparatus Co.
Scientific Glass Laboratory

Sample Bombs
Hoke, Inc.
A. B. Murray, Inc.
Shand & Jurs Co.

Services

Analytical Laboratory
Chemical Research Associates
✔ Consolidated Electrodynamics
Frank L. Crobaugh Co.
Evans Research Dev. Co.
Florida Chemists and Engineers
Arthur D. Little, Inc.

Data Processing
✔ Consolidated Electrodynamics
International Bus. Mach. Corp.

Design and Engineering
Also see Engineering-Construction Contractors Section

CHEMICAL PLANTS
George Armistead & Co.
Wyatt C. Hedrick Eng. Corp.
C. L. Mantell and Assoc.
C. W. Nofsinger Co.
Prengle, Dukler & Crump
✔ Universal Oil Products Co.

GAS PROCESSING PLANTS
Graff Engineering Corp.
Harris Engineering Co.
C. W. Nofsinger Co.
Prengler, Dukler & Crump
Tears Engineers

REFINING UNITS
George Armistead & Co.
Wyatt C. Hedrick Eng. Corp.
C. W. Nofsinger Co.
Tears Engineers
✔ Universal Oil Products Co.

STEAM AND POWER PLANTS
Jackson and Moreland, Inc.

Engineering Consultants
Ira C. Bechtold
Arthur D. Little, Inc.
C. L. Mantell and Associates
L. A. Mekler
Foster D. Snell, Inc.

Economic Surveys
R. S. Aries & Assoc.
George Armistead & Co.
Foster D. Snell, Inc.

Insulation Installation
Atlas Mineral Products Co.
Emjay Maintenance Engineers
Geo. P. Reintjes Co.
Max True Co.

Maintenance and Repair Services

CHEMICAL CLEANING
✔ Dowell, Inc.
Solvent Service, Inc.

GENERAL MAINTENANCE
✔ Catalytic Const. Co.
Refinery Constr. Co. of Houston

INSTRUMENTS MAINTENANCE
Condenser Service & Eng. Co.
Panellit Service Corp.

METALLIZING, METAL SPRAYING
Condenser Service & Eng. Co.
Emjay Maintenance Engineers
Arthur Tickle Eng. Works

RETUBING, HEAT EXCHANGER
Condenser Service & Eng. Co.
✔ Texas Metal Fabricating Co.

SAND BLASTING
Emjay Maintenance Engineers
Geo. P. Reintjes Co.

WATERPROOFING
Emjay Maintenance Engineers
Geo. P. Reintjes Co.

GUNITING AND CEMENTING
Atlas Mineral Products Co.
Emjay Maintenance Engineers
Geo. P. Reintjes Co.
Max True Co.

METALS INSPECTION
Frank L. Crobaugh Co.
Fluor Products Co.
Magnaflux Corp.
Patton Manufacturing Co., Inc.
X-Ray Engineering International

Pipe Fabrication and Erection
Atlas Pipe, Inc.
Construction Service Co.
Midwest Piping Co., Inc.

Research and Development

PROCESS
Chemical Research Associates
Evans Research and Dev. Co.
Florida Chemists & Engineers
Fluor Corp., Ltd.
Houdry Process Co.
Arthur D. Little, Inc.
✔ Universal Oil Products Co.

PRODUCT RESEARCH
R. S. Aries and Associates
Chemical Research Associates
Frank L. Crobaugh Co.
Evans Research and Dev. Co.
Florida Chemists and Engineers
Arthur D. Little, Inc.
Foster D. Snell, Inc.

Engineering-Construction Contractors

Gas Processing and Natural Gasoline Plants
Bellco Industrial Eng. Co.
Dresser Engineering Co.
The Girdler Co.
Hudson Engineering Co.
Nofsinger-Long Co.
O. L. Olsen Co.
J. F. Pritchard & Co.
Refinery Const. Co. of Houston
Refinery Engineering Co.
Russell Engineering Corp.
Southwestern Engineering Co.
✔ Stearns-Roger Mfg. Co.
Tellepsen-Petro-Chem. Constr.
Walco Eng. & Constr. Co.

Piping Systems
Construction Service Co.
Graver Construction Co.
M. W. Kellogg Co.
Kuljian Corp.
Macco Corp.

For additional information on products, services, and prices, use the enclosed Business Reply Cards.

Poling & Bacon Constr. Co.
✔ Williams Brothers

Process Furnaces and Heaters
Alcorn Combustion Co.
Fluor Corporation, Ltd.
Foster Wheeler Corp.
M. W. Kellogg Co.
The Lummus Co.
Southwestern Engineering Co.

Pumping and Compressor Stations
Bechtel Corporation
Bellco Industrial Eng. Co.
Dresser Engineering Co.
Graver Construction Co.
Macco Corp.
Nofsinger-Long Co.
Poling & Bacon Constr. Co.
✔ Stearns-Roger Mfg. Co.
Walco Eng. & Const. Co.

Refining and Chemical Process Plants
Badger Manufacturing Co.
Bechtel Corp.
Bellco Industrial Eng. Co.
Blaw-Knox Co.
✔ Catalytic Construction Co.
Construction Service Co.
Dresser Engineering Co.
Ehrhart & Associates, Inc.
Fluor Corporation, Ltd.
Foster Wheeler Corp.
The Girdler Co.
Graver Construction Co.
Hudson Engineering Co.
Kaiser Engineers
M. W. Kellogg Co.
Koppers Co., Eng. & Const. Div.
Kuljian Corp.
The Lummus Co.
Macco Corp.
Nofsinger-Long Co.
O. L. Olson Co.
Ralph M. Parsons Co.
J. F. Pritchard & Co.
✔ Procon, Inc.
Refinery Constr. Co. of Houston
Refinery Engineering Co.
✔ Stearns-Roger Mfg. Co.
Stone & Webster Eng. Corp.
Tellepsen Petro-Chem. Constr.
Vulcan-Cincinnati, Inc.
Walco Eng. & Constr. Co.
Wigton-Abbott Corp.

Steam and Power Plants
✔ Babcock and Wilcox
Bechtel Corp.
Bellco Industrial Eng. Co.
✔ Catalytic Construction Co.
Fluor Corp., Ltd.
Foster Wheeler Corp.
Kaiser Engineers
The Lummus Co.
Ralph M. Parsons Co.
J. F. Pritchard & Co.
Riley Stoker Corp.
✔ Stearns-Roger Mfg. Co.
Stone & Webster Eng. Corp.
J. G. White Engineering Corp.

Storage Tanks
✔ Chicago Bridge & Iron Co.
Columbian Steel Tank Co.
Construction Service Co.
Graver Construction Co.
✔ Hammond Iron Works
Kuljian Corp.
✔ National Tank Co.
Nooter Corp.
Poling & Bacon Constr. Co.
Vulcan-Cincinnati, Inc.

Water & Waste Treating Plants
Graver Construction Co.
Kuljian Corp.
J. F. Pritchard & Co.
✔ Procon, Incorporated
✔ Stearns-Roger Mfg. Co.
Stone & Webster Eng. Corp.

Refining Process Licenses

Acid Treating for Lube Oils
Howe-Baker Corp.
Petreco—Div. of Petrolite
Stratford Engineering Corp.

Alkylation
ALUMINUM CHLORIDE
Phillips Petroleum Co.
EFFLUENT REFRIGERATION
Stratford Engineering Corp.
HYDROFLUORIC ACID
The Fluor Corporation, Ltd.
Phillips Petroleum Co.
✔ Universal Oil Products Co.
SULFURIC ACID
Esso Research & Engineering Co.
The Fluor Corporation, Ltd.
M. W. Kellogg Co.
✔ Universal Oil Products Co.

Cracking
CATALYTIC, FLUID
Esso Research & Engr. Co.
The Fluor Corp., Ltd.
Foster Wheeler Corp.
M. K. Kellogg Co.
Phillips Petroleum Co.
Shell Development Co.
✔ Universal Oil Products Co.
CATALYTIC, BEAD TYPE
Houdry Process Corp.
Socony Mobil Oil Co.
COKING, DELAYED
The Fluor Corp., Ltd.
Foster Wheeler Corp.
M. W. Kellogg Co.
The Lummus Co.
Union Oil Co. of Cal.
✔ Universal Oil Products Co.
COKING, FLUID
Esso Research & Engineering Co.
Foster Wheeler Corp.
COMBINATION CRACKING
The Lummus Company
RESIDUUM, CATALYTIC
The Fluor Corp., Ltd.
Houdry Process Corp.
THERMAL
The Fluor Corp., Ltd.
Phillips Petroleum Co.
✔ Universal Oil Products Co.
CHEMICAL TREATING OF NAPHTHAS AND DISTILLATES
Esso Research & Engineering Co.
The Fluor Corp., Ltd.
The Lummus Co.
Magnolia Petroleum Co.
Petreco—Div. of Petrolite
Shell Development Co.
✔ Universal Oil Products Co.

Clay Treating & Filtration
Filtrol Corp.
Minerals & Chemicals Corp. of America

Crystallization, Fractional
California Research Corp.
Phillips Petroleum Co.
Texas Development Co.

Dehydrogenation, Catalytic
Dow Chemical Co.
The Fluor Corp., Ltd.
Houdry Process Corporation
Phillips Petroleum Co.
✔ Universal Oil Products Co.

Desalting
CHEMICAL DESALTING
✔ Tretolite—Div. of Petrolite
ELECTRICAL DESALTING
Howe-Baker Corp.
Petreco—Div. of Petrolite

Electrical Distillate Treating
Howe-Baker Corp.
Petreco—Div. of Petrolite

Gas Purification
The Fluor Corporation, Ltd.
The Girdler Co.

Grease Manufacturing
Sumner G. Sollitt Co.
Stratford Engineering Co.

Hydrodesulfurization
Esso Research & Engineering Co.
The Fluor Corp., Ltd.
Gulf Research & Dev. Co.
Husky Oil Co.
Shell Development Co.
Standard Oil Co. (Indiana)
Union Oil Co. of Cal.
✔ Universal Oil Products Co.

Isomerization
Atlantic Refining Co.
Esso Research & Engineering Co.
The Fluor Corp., Ltd.
M. W. Kellogg Co.
Phillips Petroleum Co.
Shell Development Co.
Standard Oil Co. (Indiana)
✔ Universal Oil Products Co.

Polymerization, Catalytic
California Research Corp.
The Fluor Corporation, Ltd.
M. W. Kellogg Co.
✔ Universal Oil Products Co.

Reforming
CATALYTIC, FIXED BED
Atlantic Refining Co.
Esso Research & Engineering Co.
The Fluor Corp., Ltd.
Houdry Process Corp.
M. W. Kellogg Co.
Phillips Petroleum Co.
Socony Mobil Oil Co.
Standard Oil Co. (Indiana)
✔ Universal Oil Products Co.
CATALYTIC, FLUID
Esso Research & Engineering Co.
The Fluor Corp., Ltd.
M. W. Kellogg Co.
Union Oil Co. of Cal. (Hyperforming)
CATALYTIC, BEAD TYPE
Socony Mobil Oil Co.
THERMAL
The Fluor Corp., Ltd.
Houdry Process Corp.
✔ Universal Oil Products Co.

Solvent Refining
AROMATICS EXTRACTION
Sun Oil Co.
✔ Universal Oil Products Co.
FURFURAL
Texaco Development Corp.
NITROBENZENE (for Lube Mfg.)
Atlantic Refining Co.
PHENOL
M. W. Kellogg Co.
PROPANE DEASPHALTING
Esso Research & Engr. Co.
M. W. Kellogg Co.
PROPANE DEWAXING
Esso Research & Engr. Co.
M. W. Kellogg Co.
SOLVENT DEWAXING
Texaco Development Corp.
SULPHUR DIOXIDE EXTRACTION
Stone & Webster Eng. Corp.
UREA DEWAXING
Standard Oil Co. (Indiana)
NITROBENZENE (for Lube Mfr.)
Atlantic Refining Co.

Petrochemical Manufacturing Process Licenses

Ammonia Manufacture
The Fluor Corp., Ltd.
Koppers Co., Inc.

Anhydrides-Maleic and Phthalic
Scientific Design Co.

Butadiene Extraction
Esso Research & Engineering Co.
Phillips Petroleum Co.
✔ Universal Oil Products Co.

Ethanolamines
Scientific Design Co.

Ethyl Chloride
Shell Delevolpment Co.

Ethylene or Acetylene Manufacture
The Fluor Corporation, Ltd.
Koppers Co., Inc.

Ethylene Glycol
✔ Universal Oil Products Co.

Ethylene Oxide
Atlantic Refining Co.
Scientific Design Co.
Shell Development Co.
✔ Universal Oil Products Co.
Vulcan-Cincinnati, Inc.

Ethylene Recovery
Koppers Co., Inc.
Scientific Design Co.
✔ Universal Oil Products Co.

Hydrogenation
✔ Universal Oil Products Co.

Polyolefins
Phillips Petroleum Co.

Polyvinylchloride
Scientific Design Co.
Shell Development Co.

Synethetic Rubber
Esso Research & Engineering Co.
Phillips Petroleum Co.
Shell Development Co.

✔Advertisement in this issue, index is on page A-6.

COMPANY DIRECTORY

A

Acme Coppersmithing and Machine Company
Oreland Pa, Mill Rd & Reading RR, Joshua Epstein, Pres — MA 5-2500
Lester P Fisher, Sales Mgr

Adsco Industries Incorporated
Buffalo 12 N Y, 20 Milburn St, D Kendall, VP-Gen Mgr — HU-1800
Chi 6 Ill, 205 W Wacker Dr, R Haack — RA 6-6961
Cleve 11 O, 12703 Triskett Rd, W J Daugherty — CL 2-1030
Det 1 Mich, 415 Brainard St, H P Osgood — TE 2-7511
N Y 22 N Y, 16 E 52nd St, L J Van Orden — EL 5-1660
Phila Pa, Phila Nat'l Bk Bldg — RI 6-3420
Pgh Pa, Oliver Bldg — GR 1-7697

Aero-Coupling Corporation
Burbank Cal, 3015 Winona Ave, C W Sawhill — TH 8-5578

Aeroquip Corporation
Jackson Mich, 300 SE Ave, Peter F Hurst, Pres — ST 2-0361

Aeroquip Inc.
Dallas Tex, 102 Express St — RI 2-3356

Airetool Manufacturing Company
Springfield Ohio, 304 S Cedar St, W T Hamilton, Pres — FA 3-4988
I T Thornson, Sales Mgr
Baton Rouge 6 La, 433 Bellewood Dr — 4-4744
Chi 19 Ill, 8416 S Vernon Ave — VI 6-2784
Houston 6 Tex, 2046 Banks St — JA 3-5926
N Y 7 N Y, 56 Church St — BA 7-6555
Prospect Park (Phila) Pa, 650 Maryland Ave — LE 2-5700
Tulsa 4 Okla, 2603 E Third St — MA 6-8852

Air Reduction Chemical Co, Div of Air Reduction Co, Inc
N Y 17 N Y 150 E 42nd St, C J McFarlin, Pres — MU 2-6700
J M Tinnon, Sales Mgr

Alco Products Incorporated
N Y 8 N Y, 30 Church St, Perry T Egbert, Pres — CO 7-8660
E N Sieder, Sales Mgr
Atlanta Ga, 490 Glenn St S W, B G Wichman — CY -7812
Beaumont Tex, 1400 Crockett St, C H Homer Jr — BE 4-3351
Chicago Ill, 909 McCormick Bldg, J W S Davis — WA 2-6234
Cleve O, 1808 Terminal Tower Bldg, M D Raymond — CH 1-1953
Houston Tex, 1404 Dunlavy St, T Gupton — JA 9-4221
L A Cal, 6363 Corsair St, M C Downs Jr — RA 3-8741
N Y 8 N Y, 30 Church St, P W Geisler — CO 7-8660
Odessa Tex, Box 1052, O Sloan — OD 7-3112
Pgh Pa, 528 Frick Bldg, W A Palmer — AT 1-7223
St Louis Mo, 4050 Bingham Ave, C A Gandy — FL 1-8810
St Paul Minn, 635 Prior Ave N, P D Curtis — MI 5-4679
San Fran Cal, 235 Montgomery St, R W Pittman — DO 2-7393

Alcorn Combustion Company
Phila 2 Pa, 1210 Schaff Bldg, Frank H. Praeger, Pres — LO 4-4215
H L Beggs, Sales Mgr
Houston 19 Tex, 3410 W Lamar St, W F Atkinson — JA 9-8233
L A 15 Cal, 714 W Olympic Blvd, E B Keatly — RI 9-1522

Aldrich Pump Company
Allentown Pa, Ft of Pine St, Box 656, Alfred Steel, Pres — HE 4-7277
R H McPeake, Sales Mgr
Representatives in Principal Cities

Allegany Instrument Company Incorporated
Cumberland Md, 1091 Wills Mtn, Harry Stern, Pres — PA 2-0880
John Zornig, Sales Mgr

Alleghany Ludlum Steel Corporation
Pgh 22 Pa, Oliver Bldg, E J Hanley, Pres — GR 1-1085
W J Adamson, Gen Mgr of Sales
Birm 1 Ala, 3515 3rd Ave S, Walton P McCord — BI 4-0548
Buff 3 N Y, 14 Lafayette Sq, R C Presley — WA -2874
Chi 32 Ill, 4747 S Kedzie Ave, W G McFadden — LA 3-8650
Cinn 27 O, 6914 Miami Rd, R D Mercer — BR 1-7412
Cleve 3 O, 1593 E 41st St, W R Kuhn — UT 1-0500
Dallas 6 Tex, 145 Meadows Bldg, W T Lewis — EM 1-2891
Dayton 4 O, Box 108 N Day Sta, I P Davies — HE-8386
Det 20 Mich, 1500 Jarvis St, I R Kiltie — JO 4-6900
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Cinn 6 O, 2330 Victory Prkwy, Tubular Products Div
Cinn 2 O, 307 E 4th St, Refractories Div
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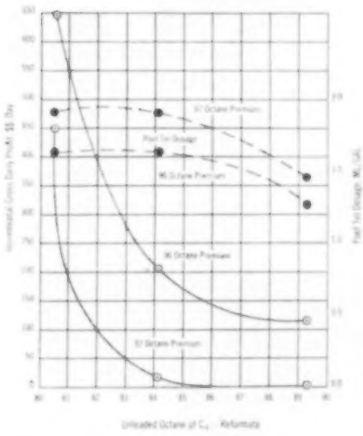
TABLE I
Economic Study of Catalytic Reforming Operations

Reformer Operation	Design	Lo Level	Hi Level	Down
C_4+Product				
Clear Research Number	84.2	81.1	89.3	Jet Fuel
Pool TEL Dosage Ml./Gal.	1.625/1.895	1.65/1.92	1.275/1.44	2.685/2.97
Premium Octane Level	96/97	96/97	96/97	96/97
Product Realization, $/CD	38880	39205	38625	30885
Variable Costs, $/CD				
96 Premium	2965	2850	2805	2965
97 Premium	3160	3045	2920	3125
Net Gross Realization, $/CD				
96 Premium	35915	36355	35820	27920
97 Premium	35720	36160	35705	27760
Incremental Gross Profit, $/CD				
96 Premium	210	650	115	
97 Premium	15	455	0	
Jet Fuel Break-Even with Best Performance Case, $/CD				
96 Premium—11.2c/Gal.				8435
97 Premium—11.1c/Gal.				8400

FIGURE I
Economic Study of Catalytic Reforming Operations



A SMALL REFINER'S PROFIT GOES UP $400 PER DAY! Du Pont's economic study recently helped a progressive refiner realize optimum performance with a newly installed catalytic reformer. Three operating conditions were compared—low-level, design, and high-level severity. Two premium gasoline octane levels, as well as jet fuel production, were considered. The above table and graph (right) pointed up the proper severity level for the refinery being studied.

These charts show how Du Pont helped a refiner

...get higher octane at lower cost

The demand for higher-octane fuels places new and increased importance on the question: How can those extra octane numbers be achieved at lowest cost?

This subject has often come up for consideration at Du Pont, especially during analyses of refinery operations and the effect of these operations on tetraethyl lead requirements.

A Du Pont service

As a result of the knowledge and experience gained in this way, our technologists have been able to help a number of refiners cut octane-improvement costs.

You can call on Du Pont to work with your own staff to develop more economical ways of boosting octane levels, or to confirm the findings of your group. Or you may prefer to have our technical representatives consider your facilities and make recommendations to fit your individual needs.

In any case you need only contact the nearest Petroleum Chemicals Division office listed at right.

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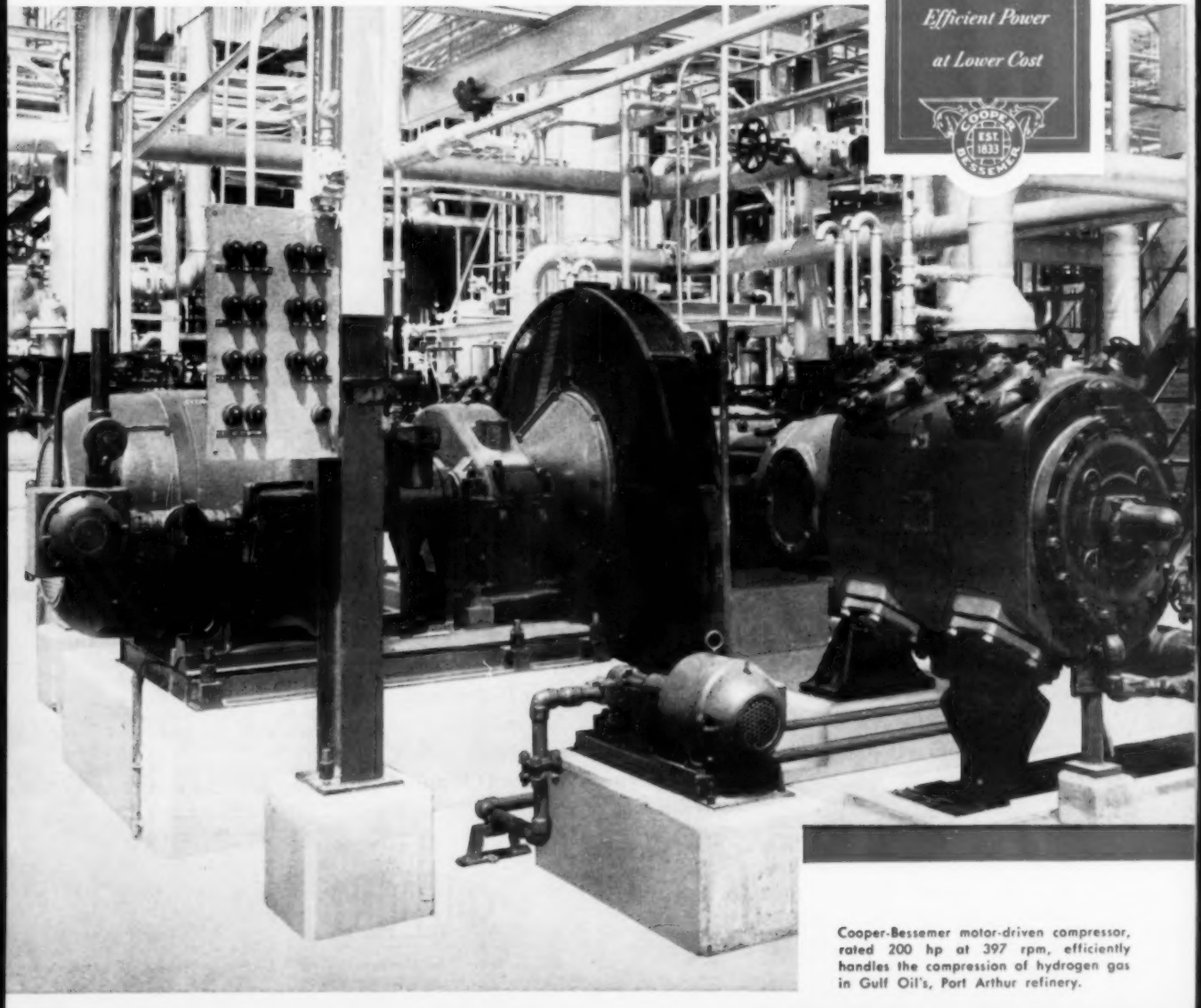
"CLEAN HYDROGEN"

for Gulf Oil

Another Example of Efficient Power at Lower Cost



Cooper-Bessemer motor-driven compressor, rated 200 hp at 397 rpm, efficiently handles the compression of hydrogen gas in Gulf Oil's, Port Arthur refinery.

GAS • DIESEL • GAS-DIESEL ENGINES

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• In the Port Arthur, Texas, refinery of Gulf Oil Corporation, non-lubricated cylinders in a 200 hp Cooper-Bessemer compressor prevent any trace of oil from entering the gas stream. What could be more simple . . . eliminate lubricating oil and you eliminate any possibility of contaminating the process.

These perfected cylinders offer the same trouble-free service that has long been standard when Cooper-Bessemer compressors are on the job. Operating against micro-smooth, hardened cylinder liners, 22½" diameter aluminum pistons with carbon rings require no lubrication whatever.

For high efficiency regardless of pressure or volume, for compactness, and low maintenance, Cooper-Bessemer, as usual, offers the best return on your investment dollar. Write The Cooper-Bessemer Corporation, Mount Vernon, Ohio, for additional information.

To maintain purity in ethylene production, this M-Line compressor is equipped with non-lubricated cylinders. Note the neat, compact arrangement of this "open air" installation.

by **Cooper-Bessemer**

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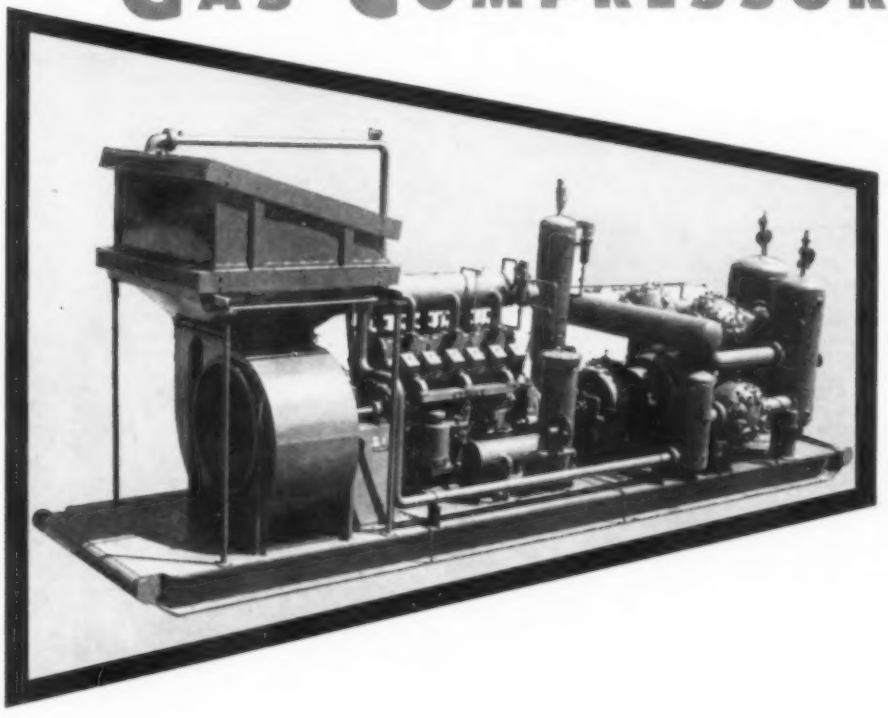
GAS COMPRESSORS

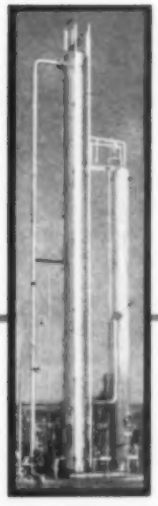


McNamar Joy-Gas Compressor units are available in one, two or four cylinder models. The four cylinder unit is rated up to 400 horsepower with one, two, three or four stages of compression, developing pressures up to 2,000 psi. The overall weight of this unit is 45,000 pounds.

Single cylinder, single stage units are rated to 100 horsepower. The two cylinder, single or two stage units are rated to 200 horsepower.

The McNamar-Joy unit is complete with rugged Joy compressor, gear reducer or belt drive, engine, cooling system, scrubbers, piping and safety controls mounted on a single structural steel skid.

The unit is extremely portable and can be moved on a tandem semi-trailer without disassembling. The arrangement of the equipment allows easy access to all parts for low maintenance costs.



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The McNamar portable gasoline plant is designed for flexible application and automatic operation. Simplicity of design assures dependable operation and low maintenance costs.

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Continuous stream analysis . . . for optimum process yields.

Good walls make good neighbors...

. . . So do good analytical instruments. **Most chemical plants are linked by raw material transfers. It's good business as well as neighborly to know the precise purity and concentration of what's being bought or sold. The Beckman Industrial Gas Chromatograph supplies this information —automatically, and in a graphic form that prevents any possible misunderstandings.**

The Beckman Model 220 Industrial Gas Chromatograph provides control engineers with a simple, fast, reliable method of continuously monitoring the composition of gases or liquids. It is especially recommended for precise measurement of oxygen, nitrogen, chlorine, carbon monoxide, sulphur dioxide, and saturated, unsaturated, aromatic or halogenated hydrocarbons containing eight atoms of carbon or fewer. It can be adapted to sample automatically from three separate streams in sequence. The analyzer unit meets explosion-proof requirements. Detection limit is approximately 100 ppm, depending on the problem; reading on individual components down to 1% may be expanded to full scale. Reproducibility is ½-2% full scale; stability, 0.1% full scale. Analysis record is presented as a complete chromatogram or a bar chart of up to eight critical components. Analysis speed is 5 to 30 min., according to problem. Beckman's Application Engineering staff tailors the Model 220 to specific problems. Write for Data File P-3-26.

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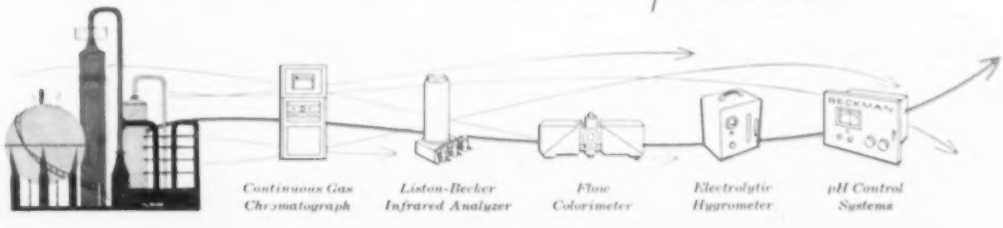

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N Y 16 N Y, 1 Park Ave, Harry Krehbiel, Pres MU 3-2100
P A Krentel, Sales Mgr—Chemical Div
Chicago Ill, 221 N LaSalle St CE 6-3066
L A Cal, 440 Seaton St MA 6-1694

✓**Catalytic Construction Company**
Phila 2 Pa, 1528 Walnut St, T Ellwood Webster, Pres KI 5-7500
Anson W Krickl, Sales Mgr
Toledo O, 1810 Oakdale Ave, R R Blickle LE -4441
Tulsa Okla, 1755 S Quincy St, W F Sims RI 2-2737

Catawissa Valve & Fittings Company
Catawissa Pa, 206 Main St, Fred R Long, Pres EL 6-3011
H N Davis, Sales Mgr

✓**Caterpillar Tractor Company**
Peoria 8 Ill, H S Eberhard, Pres, W S Zeigler, Sales Mgr 6-3311

Central Safety Equipment Company
Phila 35 Pa, 6601 Marsden St, Henry D Gordon, Pres DE 3-4788
Michael F Gordon, Sales Mgr

✓**Central Scientific Company**
Chi 13 Ill, 1700 Irving Pk Rd, J T Gossett, Pres WE 5-8600
R N Golbach, V P Sales, J F Green, GSM
Birm 4 Ala, 3232 11th Ave, V E Goodwin 54-2433
Cambridge 42 Mass, 79 Amherst St, R H Parker TR 6-3400
L A 22 Cal, 6446 Telegraph Rd, Gordon Baker RA 3-6141
Mountainside N J, 237 Sheffield St, A E Knox WE 2-5773
Santa Clara Cal, 1040 Martin Ave, V F Duensing CH 8-1600

Chain Belt Company
Milw 1 Wis, 4701 W Greenfield Ave, L B McKnight, Pres EV 4-3000
A C Lind, Sales Mgr Process Equipt
Balt 18 Md, 328 E 25th St, W W Bryne
Berkeley 10 Cal, 2940 Seventh St, R R Bolin
Chi 6 Ill, 20 N Wacker Dr, G A Gunther
Cleve 13 O, 60 Public Sq, J M Smallshaw
Dallas Tex, 8601 Sovereign Row, W W Klemme
Det 38 Mich, 10600 Puritan Ave, J C Toomey
Houston 25 Tex, 1100 E Holcombe Blvd, A B Calkins
K C 11 Mo, 406 W 34th St, J F Abelt
L A 22 Cal, 7601 Telegraph Rd, W W Dawson, Jr
N Y 6 N Y, 19 Rector St, J S Moore
Phila 24 Pa, 4125 Whitaker Ave, Harold M Weil
Pgh 13 Pa, 3400 Forbes St, G F Sherratt
St L 5 Mo, 8000 Bonhomme, C R Studer

✓**Chapman Valve Manufacturing Company**
Indian Orchard Mass, 203 Hampshire St, C G Carter, Pres LI 3-3331
Francis A Hunter, V P—Sales
Atlanta 5 Ga, 415 E Paces Ferry Rd N E EX -0311
Boston 10 Mass, 75 Federal St HU 2-8974
Chi Ill, 400 W Madison St RA 6-5804
Cinn O, 1425 Union Central Bldg MA 1-1298
Cleve 14 O, 1740 E 12th St CH 1-4108
Denver 2 Colo, 325 Denver Natl Bldg TA 5-8885
L A 23 Cal, 2941 E 11th St AN 1-2188
Houston 19 Tex, 2132 Welch Ave JA 3-2573
N Y N Y, 233 Brdwy WO 4-5545
Phila Pa, Liberty Trust Bldg LO 7-3748
Pgh 22 Pa, 717 Liberty Ave AT 1-1142
St Louis 3 Mo, 708 Shell Bldg CH 1-2113
Salt L City 1 U, Kearns Bldg DA 2-2471
San Fran 7 Cal, 564 Bryant St SU 1-1934

Chase Brass & Copper Company Incorporated
Waterbury 20 Conn, 236 Grand, Richard C. Diehl, Pres PL 6-9444
George B Moseley Sales Mgr
Atlanta 10 Ga, 695 Stewart Ave SW, A R Hooks PL 5-5731
Balt 30 Md, 1315 Key Hwy, R W Sidbury PL 2-2565
Boston 4 Mass, 411 D St, S A MacNeil LI 2-0126
Chi 39 Ill, 5401 W Grand Ave, W L Brown TU 9-4000
Cinn 2 O, 222 Post Sq, A H Heitz PA 1-3326
Cleve 3 O, 4000 Chester Ave, A E Dillingham HE 2-2300
Dallas 7 Tex, 119 Pgh St, A M Johnson RI 7-4271
Denver 16 Colo, 5101 Colorado Blvd, C J McWhinnie DU 8-2441
Det 38 Mich, 14480 Woodrow Wilson Ave, E C Eickhoff TO 8-2939
Houston 1 Tex, 16 Drennan St, P C Barzler Jr CA 2-7266
Indpls 4 Ind, 520 S New Jersey St, R Lea ME 7-1543
K C 8 Mo, 1710 Wash St, P D Evans VI 2-1710
L A 54 Cal, 6500 E Wash Blvd, R A Sternthall RA 3-5351
Milw 3 Wis, 1741 W St Paul Ave, C A Festge DI 2-7630
Mpls 3 Minn, 145 N Tenth St, F C Kaufmann FE 6-4661
Newark 8 N J, 188 Badger Ave, L F Chol BI 8-1700
N O 2 La, 751 Baronne St, J M Jolley CA -9511
N Y-Maspeth 78, 55-60 58th St, H H Bartlett TW 4-0500
Phila 40 Pa, 20th and Venango Sts, Willard M Brown BA 3-5800
Pgh 33 Pa, 1001 Brighton Rd, R H Stroth CE 1-7900
St Louis 10 Mo, 4641 McRee Ave, L J Vogler PR 6-3111
San Fran 7 Cal, 680 Second St, J D Wedlake GA 1-7780
Seattle 4 Wash, 1957 First Ave S, M A Pugh SE -1862

Chelsea Fan and Blower Company
Plainfield N J, 639 South Ave, W J Lohman Jr, Pres 5-3500
G J Read, Sales Mgr Ind Div
Representatives in Principal Cities

Chemical Process Company
Redwood City Cal, 1901 Spring St, A E Post, Pres EM 6-9586
George F Stoneman
Chi 39 Ill, 5522 W North Ave, Milton Roberts TU 9-6087
L A 15 Cal, 9th & Hill Bldg, Edward Chetakian MA 5-1524
Phila 44 Pa, 23 W Maplewood, Robert Cooley BA 6-1450
Tacoma 1 Wash, 1501 E Taylor Way, Edward Nelson BR -2020

Chemical Research Associates Incorporated
Bernardsville N J, Essex Bldg 8-1553
Dr J Rinse & Dr J C Van Dyke, Directors

Chempump Corporation
Phila 18 Pa, 1300 E Mermaid Lane, D P Litzenberg, Exec V P CH 7-6300
W W Drake, Mgr Marketg Div
Representatives in Principal Cities

✓**Chicago Bridge & Iron Company**
Chi 4 Ill, 332 S Mich Ave, E E Michaels, Pres HA 7-6708
F L Goldsby, Gen'l Sales Mgr
Atlanta 3 Ga, 57 Forsyth St N W, M G Mitchell JA 5-5561
Birmingham 1 Ala, Box 277, D A Miller WO 1-1191
Boston 10 Mass, 201 Devonshire St, J E Revelle HA 6-8441
Chi 4 Ill, 332 S Mich Ave, D A Leach HA 7-6708
Cleve 15 O, 101 Prospect Ave W, R H Menefee CH 1-1218
Detroit 26 Mich, 907 Lafayette Bldg, E D Barrett WO 3-0035
Houston 2 Tex, C & I Life Bldg, S C Hamilton CA 3-4425
N O 19 La, 312 Pan Am Life Bldg, J U Blanchard
N Y 6 N Y, 165 Brdwy, G E Borst CO 7-2900
Phila 3 Pa, 1700 Walnut St, S L Luce KI 6-4553
Pgh 19 Pa, 425 Sixth Ave, G S Trees GR 1-5559
Salt Lake City, 10 U, 550 W 17th So, J G Daniels HU 4-8551
San Fran 4 Cal, 100 Bush St, L A Elsener EX 2-8936
Seattle 1 Wash, 1318 Fourth Ave, R A Jackson SE -7487
So Pasadena Cal, 712 Fair Oaks Ave, D E Stephan RY 1-2865
Tulsa 14 Okla, 6 Dowell Bldg, E P Shelton RI 2-5511

Chicago Gasket Company
Chi 22, Ill, 1271 W North Ave, Walter K Carda, Pres HU 6-3060
Robt H Martin, Sales Mgr

Chicago Pneumatic Tool Company
N Y 17 N Y, 6 E 44th St, G J Coffey, Pres MU 7-1700
J F Huvane, VP Compressor and Engine Sales
T P Harris, VP Tool Sales
Atlanta 9 Ga, 91 16th St NW, R B Miller TR 4-8696
Boston (Brighton) 35 Mass, 76 Lincoln St, D H McSherry ST 2-8088
Chi 19 Ill, 936 E 87th St, W J Lowell HU 8-2400
Denver 4 Colo, 465 Acoma St, E R Goss RA 2-2813
Detroit 26 Mich, 570 E Larned St, H C Gilligan WO 1-3841
Houston 23 Tex, 2120 Canada Dry St, N P Donaldson WA 3-4601
L A 22 Cal, 6935 E Bandini Blvd, H P Hansen RA 3-8731
N Y 17 N Y, 6 E 44th St, A D Stem MU 7-1700
Pgh 13 Pa, 369 Coltart Ave, O W McCrillis MU 1-9822
St Louis 3 Mo, 1931 Wash Ave, L W Palmer GA 1-3090
Seattle 4 Wash, 2901 First Ave S, R S McBeth MA -3930
Wynnewood (Phila) Pa, 312 E Lancaster Ave, T A Connelly MI 9-9300

Chicago-Wilcox Manufacturing Company
Chi 19 Ill, 7701 S Avalon Ave, R B Anthony Jr, Pres SA 1-1900
R A Doyle, Sales Mgr

Chiksan Co, Subsidiary of Food Machinery & Chemical Corp
Brea Cal, 330 N Pomona Ave, H J Hagn, Pres JA 9-2121
G R Winder, V P & Genl Sales Mgr
Brea Cal, 330 Pomona Ave, R T Jones JA 9-2121
Chi 5 Ill, 600 S Mich Ave WE 9-3657
Newark 2 N J, 155 Wash St, L J Smith MI 2-7993
Oakland Cal, 600 16th St. GL 2-4202

Childers Manufacturing Company
Houston 8 Tex, 3620 W 11th St, R A Childers, Pres UN 9-3441
Jack LaFave, Sales Mgr
Representatives in Principal Cities

For additional information on products, services, and prices, use the enclosed Business Reply Cards.

Clark Bros Company, Div of Dresser Industries, Incorporated
Olean N Y, Box 560, J N MacKendrick, Pres 2-2101
Atlanta 8 Ga, 685 W Peachtree St N E, Richard Foster TR 2-3175
Chi 3, Ill, 122 S Mich Ave, A G Van Campen WA 2-9151
Houston 13 Tex, Box 4563, E G Hotze CA 8-2331
L A 58 Cal, 5120 Pacific Blvd, R C Smith LU 3-4207
N Y 17 N Y, 122 E 42nd St, R J Spears OX 7-2800
Phila 3 Pa, 1612 Market St, R C McDonald LO 7-3095
Pgh 22 Pa, 2 Gateway Center, W T Durkin CO 1-0718
Tulsa 16 Okla, Box 5367, C J Michelson TE 5-8437

Clark Manufacturing Company
Cleve 14 O, 1830 E 38th St, W S Goff, Pres EX 1-1414
W S Burford, Sales Mgr
Representatives in Principal Cities

The Clarkson Company
San Fran 4 Cal, 564 Market St, Kellogg Krebs, Pres SU 1-6613

✔Clayton Mark & Company
Evanston Ill, 1900 Dempster St, Cyrus Mark, Pres UN 4-9100
W C McNitt, Gen Sales Mgr
T Bruce Cox, Union Sales Mgr
Representatives in Principal Cities

Cleaver-Brooks Company
Milw 12 Wis, 326 E Keefe Ave, John C Cleaver, Pres WO 2-0100
Harold Holtz, Sales Mgr Boiler Div
N Y 17 N Y, 220 E 42nd St MU 2-3109

Cleveland Trencher Company
Cleve 17 O, 20100 St Clair Ave, V S Penate, Pres KE 1-4100
C P Morgan, Sales Mgr
Representatives in Principal Cities

Cochrane Corporation
Phila 32 Pa, 3171 N 17th St, T E McBride, Pres RA 5-2144
E J Bookout VP & Gen Sales Mgr
B F Saffe Western Sales Mgr
Boston 10 Mass, 55 Batterymarch St HA 6-6447
Chi 6 Ill, 309 W Jackson Blvd HA 7-0120
Milw 3 Wis, 1733 W Wisc Ave WE 3-5499
N Y 16 N Y, 261 Mad Ave MU 2-3135
Phila 32 Pa, 17th St and Alleghany Ave RA 5-2144
Representatives in Principal Cities

Coffing Hoist Division, Duff-Norton Company
Danville Ill, 800 Walter St, W I Floyd, Pres 6-3800
A M Kelly, Sales Mgr
Representatives in Principal Cities

Colonial Plastics Mfg Co, Subsidiary, Van Dorn Iron Works Co
Cleve 4 O, 2685 E 79th St, L C Jones, Pres EN 1-5234
C R Owen, Sales Mgr Industrial Div
Chi 44 Ill, 4900 W Mad, Earl C Shrader EA 9-1450
Cohassett Mass, 123 Red Gate Lane, L N Thomas 4-1071
Kennett Square Pa, Roland E Sharpless Jr 266J
Tampa Fla, 1416 E Mohawk Ave, Frank E Cold 36-4321

Columbian Steel Tank Company
K C Mo, 1509 W 12th St, J M Kramer, Pres BA 1-5020
W M Gadberry, Sales Mgr

Combustion Engineering Inc
N Y 16 N Y, 200 Mad Ave, Martens H Isenberg, Pres MU 9-4600
Donald S Walker, VP Dir of Sales
Robert M Hatfield, VP Gen'l Sales Mgr
Birm Ala, 1028 Seventh Ave S, W E Johnson BI 4-1708
Boston Mass, Chamber of Comm Bldg, J R Santry HA 6-6650
Chattanooga Tenn, 911 W Main St
Chi Ill, Bankers Bldg, A B Openshaw RA 6-2434
Cinn O, Enquirer Bldg, J Sinica Jr CH 1-6735
Cleve O, Nat'l City Bk Bldg, H G Reichard SU 1-7470
Dallas Tex, 1034 Fidelity Union Life Bldg, W K Combs RI 7-5675
Denver Colo, 2124 Brdwy, W W Joy AM 6-0323
Det Mich, Book Bldg, O A Soderberg WO 2-7546
Houston Tex, Mellie Esperson Bldg, J W Mason CA 4-0611
K C Mo, Board of Trade Bldg, T E McMahon HA 1-3011
L A Cal, 510 W Sixth St, Frank J Bader TR -6828
Mpls Minn, 2160 Rand Tower, P F W Waller FE 9-1155
N O La, 225 Lee Circle Bldg, Forney Fuller CA -3740
N Y N Y, 200 Mad Avenue, R R Beckmann MU 9-4600
Phila Pa, 1616 Walnut St, B W Webb PE 5-7020
Pgh Pa, 1 Gateway Center, J E Bass AT 1-1510
St Louis Mo, 5319 Shreve Ave, W J Woodruff EV 1-1600
Salt L City U, 415 Judge Bldg, S R Joy EM 4-5124
San Fran Cal, Stock Exch Bldg, H C Reichard YU 2-6262
Seattle Wash, Skinner Bldg, H D Nickle SE -5218

Commercial Iron Works
L A 21 Cal, 2424 Porter St, Claude Welcome, Pres TR -1051
I G Jenkins, Sales Mgr Comm Orifice Fittings
Representatives in Principal Cities

Condenser Service and Engineering Company Incorporated
Hoboken, N J, 150 Observer Highway, M W Grober, Pres 3-4425
A V Gruber, Sales Manager
Representatives in Principal Cities

Conoflow Corporation, Subsidiary of Walworth Company
Phila 3 Pa, 2100 Arch St, R B Werey, Pres LO 7-7560
J C Koch, Sales Mgr
N Y 7 N Y, 30 Church St, Chas P Boys WO 2-7553
Representatives in Principal Cities

Consolidated Chemical Industries, Div of Stauffer Chemical Co
Houston 2 Tex, 640 Esperson Bldg, E S Rothrock, Gen Mgr CA 5-5371
R P Bond, Sales Mgr Ind Chem
N Y N Y, 630 5th Ave CI 6-1350
San Francisco Cal, 111 Sutter St SU 1-8370

✔Consolidated Electrodynamics Corporation
Pasadena Cal, 300 N Sierra Madre Villa, Hugh F Colvin, Pres SY 6-0173
Albuquerque N M, 307 Wash S E, Daniel Robbins 6-3293
Atlanta 5 Ga, 3224 Peachtree Rd N E, V M Meagher CH -4467
Boston 16 Mass, Pk Sq Bldg, K S Rolley
Buff 23 N Y, 2070 Sheridan Dr, D E Stocking RI -0260
Chi 45 Ill, 2540 W Peterson Ave, T E Kirtzer
Det 35 Mich, 15800 W McNichols Rd, C J Leach VE 7-6327
Great Neck N Y, 33 Gr Nk Rd, F E Chase HU 2-7020
Houston Tex, 7449 Pk Pl Blvd, M V Perry
Palo Alto Cal, 777 Bryant St, R. O. Johnson DA 3-4114
Pasadena Cal, 1025 E Green St, D B Schneider RY 1-9631
Phila 4 Pa, 101 N 33rd St, W C Cameron EV 2-1529
San Diego, Cal, 3266 Rosecrans St, R H Kitson
Seattle 8 Wash, Box 71 Boeing Fld, E D Pettler LA -3593
Wash 5 D C, 711-14 St N W, W W Bumpus RE 7-3697

Construction Service Company
Bound Brook N J, Box 311, John J Senesy, Pres EL 6-2790
Garrie B Haulenbeek, Sales Mgr

Continental Rubber Works
Erie 6 Pa, 2000 Liberty St, Dr Paul H Henkel, Pres 2-5261
Chas C Shenk, Sales Mgr
Atlanta Ga, 477 8th St N E, I J Phillips TR 2-2245
Balt 18 Md, 15 E 21st St, R E Robertson TU 9-8866
Boston Mass, 12 Franklin St, E N Holley AL 4-2122
Buff N Y, 118 W Clippewa St, J H Kress CL -0018
Chi 10 Ill, 10 W Hubbard St, J L Berry SU 7-2848
Cinn 2 O, 49 Central Ave, A J Fox PA -7578
Cleve O, 2731 Prospect Ave, R L Woodward CH 1-4994
Det 27 Mich, 13801 Schoolcraft Ave, C W McNary VE 8-2800
Erie Pa, 2000 Liberty St, Frank H Wallace 2-5261
Indpls Ind, 309 N Capitol Ave, Fred Korn ME 4-1578
K C Mo, 5421 Holmes St, W L Zimmerman HI -6720
L A 23 Cal, 3121 E 12th St, Les Sachs AN -10168
Memphis 3 Tenn, 268 Madison Ave, G T Walker 5-2701
N Y 7 N Y, 81 Murray St, L L Smith RE 2-7770
Phila 6 Pa, 311 N Randolph St, Edw Cross MA 7-5205
Pgh 6 Pa, 6304 Penn Ave, John Neel MO 1-9291
St Louis 8 Mo, 4018 Olive St, Ben Martin JE 1-4088

C Lee Cook
Louisville 3 Ky, 916 S 8th, P W Mettling, Pres
William H Barnes, Sales Mgr
Downers Grove Ill, 3904 Earlston Rd, Joseph C Lepic WO 8-9338
Houston 2 Tex, 801 M & M Building, T F Hudgins CA 4-7821
L A Cal, 1341 S Hope St, Morgan Washburn RI 9-0561
N Y 5 N Y, 76 Denver St, Joseph C Buerkle WH 4-2438
Tulsa Okla, 4950 E 15th St, G B Gilliam WE 9-6600
Wayne Pa, 412 Oak Lane, M A Boulden WA -3916
Wheat Ridge Colo, Box 277, Darling Co HA 4-0443

Corning Glass Works, Technical Products Division
Corning N Y, W C Decker, Pres 2-5011
Campbell Rutledge Jr, Sales Mgr
Chi 54 Ill, 1470 Mdse Mart DE 7-6600
L A 17 Cal, 1125 W 6th St MI -8091
N Y 19 N Y, 718 5th Av CO 1-2025
San Fran 3 Cal, 1355 Market St MA 1-0727

Crane Company
Chi 5 Ill, 836 S Mich, P F Froeb
Albuquerque, N M. 612 First St NW, J H Smith 3-5584
Balt 1 Md, 626 W Pratt St, Russell C Margerum LE 9-2323
Beaumont Tex, 720 Fannin St, Joseph S Comeaux TE 3-1497
Billings Montana, 30th St and First Ave S, Aaron T Johnson 3-3191
Birmingham 3 Ala. 2 S Twentieth St, James J Venable AL 2-4161
Bismarck S N D, 1401 E Main St, Fred Young CA 3-2320
Boston 27 Mass, 48 Gillette Pk (So Boston) AN 8-1900
Buff 5 N Y, 201 Church St, Gustaf E Anderson CL -1414
Casper 5 Wyoming, 802 E "C" St, Laurence G Robben 2-5321
Chi 6 Ill, 156 N Jefferson St, T D Kelly AN 3-1650
Cinn 1 O, 824 Brdwy, W D LaRue CH 1-1312

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Cleve 3 O, 6215 Carnegie Ave, J F Stump UT 1-2400
Columbia S C, 716 Huger St, G W Stradtman Jr 4-6906
Columbus 15 O, 67 N Front St, R C McNeill CA 4-7221
Corpus Christi Tex, 4433 Baldwin Blvd, W C Frazier TU 3-1731
Dallas 22 Tex, 814 Young St, J Vernon Edmondson RI 2-4506
Denver 17 Colo, 1631 Fifteenth St, John J Murray KE 4-5111
Detroit 28 Mich, 8880 Hubbel Ave, Chas H Lovelace BR 3-4600
East Chicago Indiana, 1004 E Chi Ave, C M McDermott EA -6996
El Paso Tex, 1609 Texas St, C Raymond Curtan 3-3486
Houston 1 Tex, 2204 Pease Ave, C O Prickett CA 7-7101
Indpls 6 Ind, 333 W Market St, W Stanley Hague ME 5-1521
Jackson 5 Miss, 176 N Gallatin St, Eugene H Payne Jr 2-6628
Jacksonville 3 Fla, 1007 W Bay St, Augustus N Sharp Jr EL 4-5621
K C 8 Mo, 2819 Warwick Trafficway, N S Edwards GR 1-5460
Lima O, 207 S Central Ave, Ralph C Schroeder 2-1675
Little Rock Ark, 1000 E 2nd St, Arthur C Gribble FR 4-2387
L A 54 Cal, 321 E Third St, D R Nordwall MA 6-4211
Louisville 2 Ky, 756 S First St, Charles E Sims JU 4-8201
Memphis 1 Tenn, 254 Court Ave, Barney O'Kane JA 5-1561
Milwaukee 3 Wis, 2123 W Mich St, R H Allen DI 2-2321
Mpls 1 Minn, 400 Third Ave N, E L King FE 3-3441
N O 11 La, 710 S Broad St, M F DuChateau TU -8211
N Y 17 N Y, 101 Park Ave RA 9-7222
Norfolk 10 Va, 2 E Twenty-Second St, Glenn B Batchelor MA 2-2323
Okla City 2 Okla, 705 W Main St, Carroll L Alexander FO 5-7421
Omaha 8 Neb 323 S Tenth St, A N Rosborough JA -6442
Phila 22 Pa, 245 Master St, B C Gonaver ST 2-1800
Phoenix Ariz, 233 S First Ave, Walter M Taylor AL 8-6831
Pgh 30 Pa, 40 24th St, Horace R Riggs AT 1-8121
Pocatello Idaho, 756 S First Ave, Wallace J Rhodes 2122
Portland 8 Oregon, 710 NW Fourteenth Ave, Robert C Smith SP 2-8364
Reno Nevada, 401 E Fourth St FA 2-2151
St. Louis 3 Mo, 30 S 16th St, Oscar F Woodyard CH 1-3151
Salt L City 10 U, 307 W Second South St, G C Perry EM 3-5801
San Antonio 6 Tex, 1200 E Houston St, Edward J Kropp CA 7-3123
San Diego 1 Cal, 1138 India St, Robert E Muse BE 3-8126
San Fran 19 Cal, 301 Brannon St, Chas A Warden SU 1-3900
Seattle 24 Wash, 419 Second Ave S, John H Angevine SE-1323
Shreveport 92 La, 1320 Winston St, Emile P Martin 3-4231
Tacoma 1 Wash, 1209 "A" St, R A Wilcox BR-3123
Tallahassee Fla, 2010 S Monroe St C G Wiggins Jr 2-1697
Toledo 1 O, 390 S Erie St, J W Robitzer CH 4-8654
Tulsa 2 Okla, 623 E Third St, V Kornhaus LU 5-8285
Wichita 1 Kan, 624 E First St, Allan P Francis AM 2-2471

Crane Packing Company
Morton Grove Ill, 6400 W Oakton St, K V Rohlen, Pres KE 9-4534
C E Schmitz, V P—Sales
Bala-Cynwyd Pa, 5 E Montgomery Ave WE 4-5388
Buff 7 N Y, 1807 Elmwood Ave BE -3992
Cinn 37 O, 1720 Section Rd EL 1-3480
Cleve 6 O, 10623 Chester Ave SW 1-4950
Det 35 Mich, 16599 Meyers Rd UN 4-8300
Denver 4 Colo, 1029 Santa Fe Dr, Ralph E Copher Jr AL 5-8744
Hackensack N J, Box 7, S Hack HU 7-3212
Houston 11 Tex, 6626 Supply Row WA 3-7683
Indpls 2 Ind, 1637 N Illinois St WA 6-1686
Louisville 7 Ky, 131 Breckenridge Lane TW 5-8606
Milw 11 Wis, 3803 N Oakland Ave WO 4-0660
Morton Grove Ill, 6400 W Oakton St OR 4-0100
N Hollywood Cal, 11905 Sherman Way PO 5-0357
Pgh 27 Pa, 4135 Brownsville Rd TU 4-0131
San Fran 5 Cal, 53 Stevenson St YU 6-5300
Seattle 1 Wash, 1402 3rd Ave MA -3661
Tulsa 3 Okla, 210 Midco Bldg CH 2-6340

Frank L Crobaugh Company
Cleve 14 O, 3800 Perkins Ave, O M Beach, Pres UT 1-7320

Crosby Steam Gage & Valve Company Incorporated
Wrentham Mass, 43 Kendrick St, William P Husband Jr, Pres EV 4-3121
J J Bresnahan, Sales Mgr
Chi 4 Ill, 220 S State St, J J Soukup HA 7-7033
Dallas 1 Tex, 1211 Dragon St, Max Zischkale RI 1-4771
L A 22 Cal, 5346 Jillson St, C F Dempsey AN 8-5109
N Y 6 N Y, 165 Brdwy, Henry Cleeves CO 7-2074

Crouse-Hinds Company
Syracuse 1 N Y, Wolf & 7th N Sts, J R Tuttle, Pres 74-1011
E P Monesmith, Sales Mgr
Birmingham 9 Ala, 2920 S 18th St, M J Booth TR 1-4813
Boston 10 Mass, 605 Chamber of Comm Bldg, D J Parker LI 2-9881
Buffalo 2 N Y, 1020 Prudential Bldg, C C Pratt WA -5011
Chi 6 Ill, 600 W Jackson Blvd, W L Johnson FR 2-5917
Cinn 37 O, 7373 Brookcrest Dr, W C Cowell RE 1-8231
Cleve 15 O, 1068 Hanna Bldg, W J Feahr CH 1-5446
Dallas 2 Tex, 4607 Cole Ave, J E Metzenthin RI 7-1691
Denver 4 Colo, 1156 Bannock St, T J Vieau TA 5-6639
Detroit 2 Mich, 5-107 Gen Motors Bldg, G G Snyder TR 5-4355
Houston 4 Tex, 2801 San Jacinto St, G G Griffin CA 5-3201
Indpls 20 Ind, 5425 College Ave, R H Goodwin CL 1-7736
K C 8 Mo, 3021 Main St, V W Nadler LO 1-4968
L A 15 Cal, 714 W Olympic Blvd, H L White RI 9-3189
Milw 11 Wis, 3803 N Oakland Ave, P S Linscott WO 4-1870
N O 7 La, 860 St Charles Ave, W A Barnes CA -9529
N Y 7 N Y, 11 Park Place, A F Uhrlandt CO 7-0750
Phila 2 Pa, 112 S 16th St, C Knox RI 6-9570
Pgh 22 Pa, 1015 Empire Bldg, J J Bangert GR 1-6882
Portland 9 Ore, 212 N W 14th Ave, F A Waker CA 7-2115
St Louis 8 Mo, 3732 Wash Blvd, J A Webb JE 1-5555
St Paul 14 Minn, 2397 Univ Ave, J A Bower MI 5-5545
San Fran 7 Cal, 370 Brannan St, W R Major GA 1-4267
Seattle 9 Wash, 566 Broad St, L F Busse AL -7262
Tulsa 19 Okla, 19 W 10th St, W J Klaus GI 7-7107

W H Curtin & Company
Houston 1 Tex, 4220 Jeff Ave, C J Green Sr, VP WA 3-1661
Birmingham 3 Ala, 315 Brown Marx Bldg AL 1-9339
Corpus Christi Tex, 519 S Water St TU 4-5652
Dallas 22 Tex, 1812 Griffin St, C J Greene Sr RI 7-2503
Jacksonville Fla, 2335 Market St EL 5-5426
N O 13 La, 621 Celeste St TU 0475
Tulsa Okla, 817 S Boulder St GI 7-8854

Cutler-Hammer Incorporated
Milwaukee 1 Wis, 315 N 12th St, Philip Ryan, Pres BR 1-7800
P S Jones, VP—Sales
Atlanta 8 Ga, 714 Spring St NW, B R Stratton TR 4-9746
Baltimore 18 Md, 2319 Maryland Ave, M C Larson HO 7-9001
Birmingham 9 Ala, 323 Oxmoor Rd, F L Sheram TR 9-6776
Boston 35 Mass, 415 Western Ave, J A Anderson AL 4-6210
Buffalo 25 N Y, 3385 Harlem Rd, R L Hibbard AT 4444
Chi 6 Ill, 400 W Madison St, R A Haworth ST 2-4960
Cinn 2 Ohio, 804 Plum St, E C Bolton CH 1-5111
Cleve 7 O, 1521 W 117th St, O P Proudfoot AC 1-0100
Col 9 O, 2700 E Main St, R D Yoder BE 1-6110
Dallas 2 Tex, 1331 Dragon St, E. A. Clark RI 8-2101
Denver 4 Colo, 126 W 5th Ave, C M McElroy SH 4-2495
Detroit 38 Mich, 15427 Woodrow Wilson Ave, E F Weiss TU 3-1600
Fresno 21 Cal, 155 Van Ness Ave, J G Fore AM 8-3301
Grand Rapids 2 Mich, 403 Bldg & Loan Bldg, W G Cuflip GL 6-8529
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Midland Tex, 4017 Roosevelt Blvd, T D Sevar MU 3-3421
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N Y 18 N Y, 8 W 40th St, W E Addicks PE 6-8400
Omaha Neb, 320 W O W Bldg, G A Tice HA- 8600
Phila Pa, 65 West Ave, Wayne Pa, I P Simon TR 8-0820
Pgh 22 Pa, 355 Fifth Ave, O P Robinson AT 1-8513
Port 4 Ore, 208 S W Stark St, F J Woldrich CA 7-2405
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D

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J V Moore, Sales Mgr

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Chi Ill, 30 N LaSalle St, Harry J Werron — FL 6-3250
NY NY, 52 Vanderbilt Ave, Wm H Sullivan — MU 5-6825
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Jerry Moss, Sales Mgr

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R D Lindsay, Sales Mgr
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Corpus Christi Tex, 1652 S Brownlee — TU 3-0541
Houston Tex, 3301 Montrose Blvd — JA 4-3587
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Cleve 13 O, 633 Penton Bldg — CH 1-0736
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Memphis 3 Tenn, 1381 Heistan Pl — 32-1736
N Y 16 N Y, 99 Park Ave — OX 7-0440
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Chi 1 Ill, 333 N Mich Ave, H L Vallandigham — FR 2-5445
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L A 17 Cal, 612 S Flower St, M B Harris — MA 9-1611
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St Louis 24 Mo, 8251 Maryland Ave, W E Wallin — PA 5-8844
San Fran 5 Cal, 55 New Montgomery St, G W Bregar — SU 1-3204

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Fred Ebeling, Genl Sales Mgr
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N Y 6 N Y, 75 West Street — BO 9-4716
San Fran 5 Cal, 55 New Montgomery St — DO 2-8434

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Midland Mich, Dr W R Collings, Pres — TE 2-2371
O D Blessing, Sales Mgr
Alhambra Cal (L A) 3033 W Mission Rd, J J Tyner — CU 3-6421
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Chi 39 Ill, 6101 W Fullerton Ave, R W Kolderman — TU 9-5900
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N Y 20 N Y, 600 5th Ave, E J Smith — JU 6-7200

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Downington Pa, H E Brumder, Pres, E C Ashton, Sales Mgr — 225

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Charles A Cone, Sales Mgr

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Phila 7 Pa, 611 Widener Bldg — RI 6-0216
San Fran Cal, 101 S Airport Blvd — PL 5-8778

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Mineola N Y, 147 E 2nd St, R R Leech, Genl Mgr — GA 7-6805
K A Weits, Sales Mgr
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Detroit 35 Mich, 13000 W Seven Mile Rd, F J Flaiz UN 4-1963
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Wilmington 98 Del, 1007 Market St OL 4-5121
David H Conklin, Director of Sales
E H Simpson, Sales Mgr Tetraethyllead Div
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Chi 3 Ill, 8 S Mich Ave, E G Bennett RA 6-8630
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Tulsa 19 Okla, 1811 S Balt Ave, D W Frison LU 5-5578

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Phila Pa, 1616 Walnut St, M L Shaw Jr KI 6-4600
St Louis Mo, 818 Olive St, P Woodworth CE 1-8532

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Chi 5 Ill, 600 S Mich Ave, L J Gregory HA 7-9876
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Decatur Ga, 1157 Holly Dr (Atlanta), Carl Houck EV -3415
Ft Wayne 7 Ind, 636 Putnam St, J R Munn AN 8-7594
Houston 6 Tex, Box 6163 Fairview Sta, A Walker JA 2-7952
Huntington 1 W Va, 115 W Ninth Ave, R P Van Blaricom 4-1639
K C 12 Mo, 1412 W 47th St, H A Walbridge JE 1-6550
Lansing Mich, 1317 Pulaski St, R C Hruska IV 9-1169
L A 22 Cal, 4935 E Olympic Blvd, J E Rogers AN 9-4684
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Newark Del, 105 Bent Lane, John H Cronin DE 8-2223
Roch 19 N Y, 61 Roselind St, Allen Gray GE-1926
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Buff 23 N Y, 1965 Sheridan Dr, G W Bird RI-5915
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Houston 2 Tex, 682 M & M Bldg, W D Bradley CA 7-6958
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J R Caudle, VP Chem Sales
E M Lundgren, Sales Mgr
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E A Von Doersten, Div Mgr
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Cleve 20 O, 13212 Shaker Square SK 1-2082
Chi 1 Ill, 360 N Mich Ave AN 3-0868
Framingham Mass, 65 Concord St TR 3-3443
Houston Tex, 1300 Main St CA 7-5221
N Y 16 NY, 260 Madison Ave OR 9-1820
St Louis 5 Mo, 10 S Brentwood Blvd PA 7-4608

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W L Luzan, Sales Mgr
San Fran 11 Cal, 444 Mrkt St, C W Pacs YU 2-1016

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Toledo 1 O, Chestnut & Champlain Sts, J P Falvey, Pres CH 3-3131
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James G Park, VP Sales
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Dr Murray Berdick, Coord of Research
Dr Wm E Holland, Development Mgr

F

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Cleve Hts 18 O, 3091 Mayfield Rd YE 2-6242
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Nutley 10 N J, 139 Chestnut St, Geo H Birchall Jr NU 2-7710
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Floridin Company
Tallahassee Fla, Box 989, D H Mowell, Pres 2-8070
G C Jones, Refinery Sales Mgr

Fluor Corporation Limited
L A 22 Cal, 2500 S Atlantic Blvd, J S Fluor, Pres AN 2-6111
J P Kneubuhl, V P—Sales
Houston Tex, 1594 Houston Club Bldg CA 5-0491
N Y 17 N Y, 589 Fifth Ave EL 5-4811
Pgh 34 Pa, Box 10396 FI 1-9181
San Fran Cal, 120 Montgomery St. SU 1-5805

Fluor Products Company
Whittier Cal, 12000 E Wash Blvd, James P Wiseman, Pres OX 3-3761
George H Dieter, V P—Sales
O Laurens Pratt, Sales Mgr Cooling Tower Div
L O Obert, Sales Mgr Santa Fe Tank Div
David Fields, Sales Mgr Extrusion, Paola Kans
Representatives in Principal Cities

Foster Engineering Company
Union N J, 835 Lehigh Ave, Fergus Reid Jr, Pres MU 6-8800
George Bauer, Sales Mgr
Dallas Tex, 6234 Peeler St, J B Newman FL 2-0760
Houston 5 Tex, 2226 Bissonnet St, Ken Mercer JA 6-1249
New Orleans 6 La, 232 Canal St, Edgar Murray TU -0481

Foster Wheeler Corporation
N Y 6 N Y, 165 Brdwy, E W Mills, Pres WO 4-4400
W L Martwick, Genl Sales Mgr
Boston 10 Mass, 80 Federal St, Al Downham HA 6-0117
Chi 3 Ill, 105 W Adams St, J Kenney RA 6-8673
Cleve 14 O, Leader Bldg, A Balthasar MA 1-8225
Dallas 1 Tex, 505 N Ervay St J Bell RI 8-2442
Detroit 26 Mich, Mich Bldg, Hugh Deans WO 1-4495
Houston 2 Tex 711 Main St, W Pais & B Gilligan CA 2-7314
K C 5 Mo, 1004 Baltimore, J Taylor HA 1-1575
L A 15 Cal, 714 W Olympic Blvd, C Moore RI 9-7839
Phila 2 Pa, Packard Bldg, N A Scott RI 6-2888
Pgh 22 Pa Oliver Bldg, C Russell AT 1-4987
San Fran 5 Cal, 461 Market St, R Spear GA 1-6042

Foxboro Company
Foxboro Mass, 38 Neponset Ave, B H Bristol, Pres KI 3-5381
H O Ehrisman, Genl Sales Mgr
Appleton Wis, 109 S Appleton St, M A Schreiner RE 3-8707
Atlanta 5 Ga 3224 Peachtree Rd N E, E W Prendergast CE 7-6437
Bala-Cynwyd (Phila) Pa 1 Bala Ave, G H Gleason MO 4-9994
Balt 10 Md, 201 Tuscany Rd 3G, E R Slone BE 5-5853
Birmingham 4 Ala, 113 N 9th St J M Waters 4-9949
Cinn 2 O 607 American Bldg W C Bachelor GA 1-2280
Cleve 7 O 1579 W 117th St, H L Lee RO 2-1040
Corpus Christi Tex 1905 N Port Ave W G McDaniel TU 4-8958
Dallas 18 Tex, 11710 E NW Hwy, E L Stark DA 7-4531
Det 38 Mich, 15770 Wyoming Ave E M Kelly UN 4-9535
Foxboro Mass, 15 Wall St, H H Michelmore CA 7-1353
Greenville S C, S C Nat Bk Bldg W W Barron 3-4255
Houston 6 Tex, 2518 S Blvd J M Temple JA 8-5431
Knoxville 20 Tenn, 4307 Chapman Hwy, C A Mohler 7-4673
K C 13 Mo, 6315 Brookside Plaza, G J Willier JA 3-8018
L A 21 Cal, 2307 E 8th St, E W Pitt TU -3815
N O 22 La, 2067 Caton St, G W Reed Jr CR -5541
N Y 17 N Y, 420 Lex Ave, E R Huckman LE 2-4682
No Tonawanda (Buff) N Y, 4 Webster St J G Dobson JA -8721
Pgh 5 Pa, 2270 Noblestown Rd W N Stancati WA 2-0702
Odessa Tex, 407 W 2nd St, W Rochelle FE 2-9343
Rich 26 Va, 2100 Bremo Rd, G E Clark RI 88-1382
St L 17 Mo, 6617 Clayton Rd S M Rudder PA 7-5372
San Leandro (San Fran) Cal, 399 Predo St, F J Renner LO 2-5525
Shreve La, 306 Ricou-Brewster Bldg, R S Yahrmarkt 3-4304
Skokie (Chi) Ill, 4546 Oakton St, J E Ayers CO 7-5810
Tulsa 3 Okla, 211 W 5th St, J E Hewson DI 3-8189
Wilmington 1 Del, 214 W 10th St OL 6-6674

✔**Franklin Supply Company**
Chi 5 Ill, 624 S Michigan Ave, Jene Harper, Pres WE 9-0811
Lawrence Harper, VP Sales Tulsa Okla LU 4-4185
Dallas Tex, 1838 Republic Natl Bk Bldg Robert E Brewster RI 8-4934
Denver Colo, 1504 Denver Club Bldg, Donald F Davis AC 2-8966

✔Advertisement in this issue, index is on page A-6.

Houston Tex, 1203 Texas Natl Bk Bldg, Gary Bangert — CA 8-9301
Midland Tex, Box 2596, Robert Spellman — MU 2-0423
N Y N Y, 60 E 42nd St, John J Orr — MU 7-3566
Tulsa Okla, Rm 915 First Natl Bldg, William Mitchell — LU 4-4185

Freeport Sulphur Company
N Y 17 N Y, 161 E 42nd St, Langbourne M Williams, Pres — MU 7-8100
George B Moran, V P—Dir of Sales

Fuller Company
Catasauqua Pa, 124 Bridge St, A E Douglass, Pres — CO 4-2841
C C Kaesemeyer, Genl Sales Mgr
E P Meixsell, Sales Mgr Compressor Div
Birm 3 Ala, 2000 First Ave, W F Hahn — 53-3068
Chi 3 Ill, 135 S LaSalle St, P M Klein — DE 2-5024
K C 15 Mo, 20 On The Mall, Prairie Vill, D W Armstrong — EN 2-2345
L A 36 Cal, 5225 Wilshire Blvd, J G Dougherty — WE 3-7126
San Fran 4 Cal, 564 Market St, L F Bast — YU 6-5486
Seattle 9 Wash, 120 Sixth Ave N, M W deBruyn — MU -3131

G

Gar Wood Industries Inc
Wayne Michigan, E F Fisher, Pres
D J Davis, Sales Mgr Construction Equip
H H Hippler, Sales Mgr Truck Equip

Gates Engineering Company
Wilmington 99 Del, 100 S West St, A J Seiler, Pres — OL 6-9951
G P Kern Jr, V P—Sales
Dallas Tex, 172 Leslie St, Richard L Heyden — RI 1-3226
Englewood Colo, 100 E Jefferson, Walter B Wilson — SU 1-0416
Livonia Mich, 35656 Minton Dr, Wallace G Nielson — GA 1-9150
Lombard Ill, 125 W Madison Dr, Edward MacKay — 3778
Newton Centre Mass, 19 Brentwood Ave, S W Warshaw — BI 4-1435
Phila 18 Pa, 7718 McCallum St, Raymond Markloff — CH 7-7602
Pgh 22 Pa, 369 S Graham St, H S Aufderheide — MO 1-8604
St Louis 3 Mo, 3545 Lindell Blvd — OL 2-0290
Seattle 8 Wash, 4429 Airport Way, Aubrey Davis Jr — MA -5742
Shreveport La, 922 Kirby Place, Hines F Vaughan — 4-8895

Gearench Manufacturing Company
Houston 1 Tex, 317 Hughes, C E Olsen, Pres — VA 1-4188

General Controls Company
Glendale 1 Cal, 801 Allen Ave, William A Ray, Pres — VI 9-2181
J F Ray, V P—Chg of Sales
Atlanta Ga, 1479 Spring St N W — TR 6-4419
Balt 24 Md, 534 S Conkling — OR 5-7800
Boston 59 Mass, 367 Boylston — BI 4-8160
Buff 23 N Y, 960 Kenmore Ave — VI -0110
Chatt 4 Tenn, 1805 McCallie Ave — 98-2012
Chi Ill, 8080 McCormick Blvd, Skokie, Ill — IR 8-9057
Cinn 2 O, 307 E 4th St — PA 1-8162
Cleve 3 O, 4317 Chester Ave — EX 1-0555
Col 12 O, 1219 W Third Ave — AX 4-4266
Dallas 7 Tex, 1804 N Industrial Blvd — RI 1-3494
Denver 4 Colo, 1162 Elati St — CH 4-6776
Des Moines 11 Iowa, 2300 Cottage Grove Ave — AT 8-4325
Det 27 Mich, 15114 Plymouth Rd — VE 5-5625
Hartford Conn, 410 Asylum St — CH 7-0300
Houston 6 Tex, 3607 S Sandman St — JA 3-5671
Indianapolis 22 Ind, 2915 W 16th St — ME 6-2537
K C 8 Mo, 2904 Oak St — JE 1-2400
L A Cal, 801 Allen Ave (Glendale) — VI 9-1483
Milwaukee 8 Wis, 3805 W Vliet St — DI 4-2023
Mpls 26 Minn, 6522 Walker St — WE 9-7111
N O 15 La, 4028 Thalia St — TU -8247
N Y N Y, 31-31 Thomson Ave, L I City — EX 2-3880
Omaha 2 Neb, 610 Keeline Bldg — AT -3416
Phila 4 Pa, 4028 W Girard Ave — EV 6-4445
Phoenix Ariz, 108 S 6th St — AL 3-1368
Pgh 22 Pa, 4 Smithfield St — CO 1-3858
Port 14 Ore, 1620 S E Hawthorne Pl — BE 4-9373
Salt Lake City 1 U, 353 W 4th St So — EL 5-7611
San Fran 7 Cal, 600 Bryant St — SU 1-7580
Seattle 9 Wash, 925 Westlake Ave N — EL -0045
St L 10 Mo, 1330 Hampton Ave — MI 7-4702
Tulsa 20 Okla, 1316 S Peoria Ave — DI 3-0054
Wichita 2 Kans, 352 N Broadway — AM 7-9845

General Electric Company
Schenectady 5 N Y, 1 River Road — FR 4-2211
Atlanta 3 Ga, 1860 Peachtree Rd N W — TR 6-2451
Balt 1 Md, 111 Park Ave — MU 5-6500
Baton Rouge 6 La, 3170 Florida Blvd — 3-7561
Beaumont Tex, 1385 Calder Ave — 2-8453
Billings Mont, 303 N Brdwy — 2-2051
Chi 80 Ill, 840 S Canal St — WA 2-5611
Cinn 6 O, 2621 Victory Pkwy — PA 1-3431
Cleve 4 O, 4966 Woodland Ave — EN 1-4464
Corpus Christi Tex, 205 N Chaparral St — TU 4-4933
Dallas 2 Tex, 1801 N Lamar St — RI 1-9121
Des Moines 9 Ia, 505 W Fifth Ave — 3-0194
Detroit 2 Mich, 700 Antoinette St — TR 2-2600
El Paso Tex, 215 N Stanton St — 3-7553
Gulfport Miss, 207 Jo-Fran Bldg — 346
Houston 1 Tex, 1312 Live Oak St — CA 5-0261
Lake Charles La, 422 7th St — HE 3-3116
Little Rock Ark, 103 W Capitol Ave — FR 5-1273
L A 54 Cal, 212 N Vignes St — MA 5-7381
Milw 3 Wis, 940 W St Paul Ave — BR 1-5000
N Y 22 N Y, 570 Lexington Ave — PL 1-1311
Phila 2 Pa, 3 Penn Center Plaza — LO 8-1800
Phoenix Ariz, 220 Luhrs Tower — AL 8-7724
Pgh 22 Pa, Oliver Blvd, Mellon Sq — AT 1-6400
Sacramento 14 Cal, 626 Forum Bldg — GI 3-1788
St Louis 1 Mo, 818 Olive St — GE 6-4343
Salt Lake City 9 Utah, 200 S Main St — 4-1891
San Antonio 5 Tex, 434 S Main Ave — CA 6-8349
San Diego 1 Cal, 1240 Seventh Ave — BE 3-6461
San Francisco 6 Cal, 235 Montgomery St — DO 2-3740
Shreveport La, 206 Beck Bldg — 3-8554
Tacoma 1 Wash, 1019 Pacific Ave — BR -8361
Tulsa 3 Okla, 320 S Boston Ave — LU 5-8267
Wichita 2 Kan, 200 E First St — AM 7-4263

General Electric Company, Construction Materials Division
Bridgeport 2 Conn, 1285 Boston Ave — 4-1012
J O Overstreet, Sales Mgr Wire and Cable
R E Elmendorf, Sales Mgr Conduit Products
Boston 10 Mass, 136 Federal St, J H Newman — HU 2-1800
Chi 38 Ill, 5726 W 51st St, C R Shields — RE 5-2244
Cinn 6 O, 2621 Victory Pkwy, L L Young — PL 1-3130
Cleve 11 O, 4520 W 160th St, S D Hopper — CL 2-3600
Houston 20 Tex, 5718 Armour Dr, Jack Peevy — WA 8-5491
L A 58 Cal, 3000 E 46th St, W W Bryan — LU 2-8211
N Y 22 N Y, 570 Lex Ave, O A Kirkland — PL 1-1311
Phila 4 Pa, 3198 Chestnut St, W E Swenson — EV 2-6600
St Louis 8 Mo, 3928 Lindell Blvd, O W Cerny — JE 5-3845

General Electric Company, Silicone Products Department
Waterford N Y, Mechanicville Rd, Dr C E Reed, Genl Mgr — AD 8-3330
T C Ohart, Sales Mgr
Boston 1 Mass, 140 Federal St, A L Baldock — HU 2-1800
Charlotte N C, 514 Johnston Bldg
Chi 80 Ill, 840 S Canal St, M C Lauenstein — WA 2-5611
Cleve O, 1507 Brookpark Rd, F M Pugh — MA 1-0150
Dallas Tex, 6617 Snider Plaza, T A Venia — LA 8-3738
Detroit 14 Mich, 2211 Wooward Ave — WO 3-7811
L A 17 Cal, 1052 W 6th St, R T Daily — MA 6-4373
Newark N J, 254 Elizabeth Ave — BI 3-6074
Phila Pa, 1405 Locust St — PE 5-9028

General Tire & Rubber Company, Chemical Division
Akron 9 O, 1708 Englewood Ave, W O'Neil, Pres — RE 3-6311
L W Reeves, Sales Mgr, George Hackim, Sales Mgr Vinyl Div

Gilbert & Barker Manufacturing Company
W Springfield Mass, Irving C Jacobs, Pres — SP 3-4161
J A MacDonnell, Genl Sales Mgr
Chi Ill, 600 S Mich Ave, E J Walters — HA 7-2727
N Y N Y, 15 W 51st St, J F Deitz — CI 7-0013

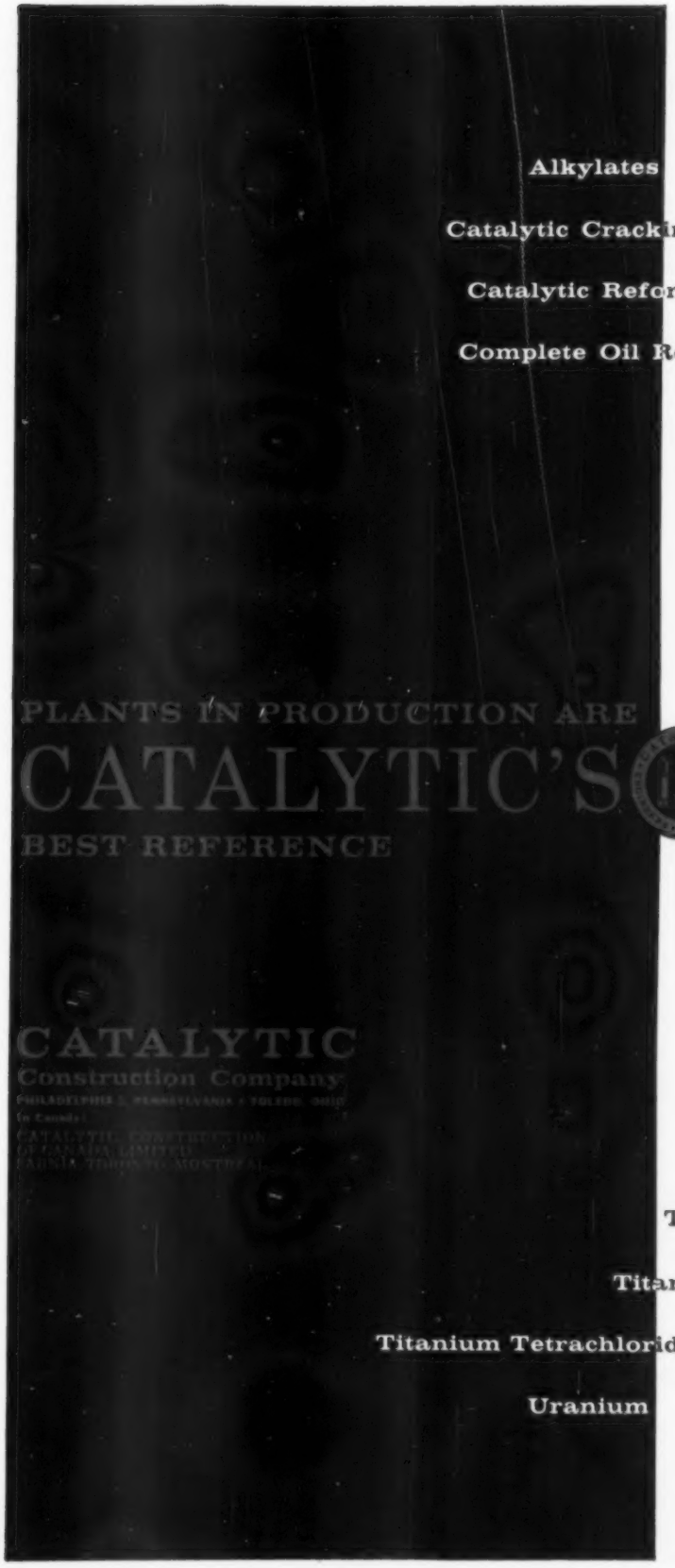
Girdler Company, Division of National Cylinder Gas Company
Louisville 1 Ky, 224 E Brdwy, George O Bloomer, Pres — JU 7-7551

The Glidden Company, Paint Division
Cleve 14 O, 900 Union Commerce Bldg, D P Joyce, Pres — PR 1-5121
T N Armel, Ind Sales Mgr

Fritz W Glitsch and Sons Incorporated
Dallas Tex, Box 6227, Hans C Glitsch, Pres — FE 1-3221
R L Allen, Sales Mgr
Chi Ill, 7530 N Sheridan, W R Greenman — AM 2-6196
Cleve O, 313 Engineers Bldg, N Nesbitt Jr — CH 1-5292
Houston Tex, 2480 Times Blvd, Tom E Wright — JA 2-4729
L A Cal, 325 W 17th St, S G Higginbotham — RI 9-0291
N Y N Y, 11 W 42nd St, J J Tunno — LA 4-2287
Tulsa Okla, 307-A Daniels Bldg, Bryan A Ross — LU 3-2486

B F Goodrich Chemical Company
Cleve 15 O, 3135 Euclid Ave, John R Hoover, Pres — MA 1-8812
George A Fowles, Sales Mgr—Plastic Dept
W D Parrish, Sales Mgr—Rubber Dept
L R Modlin, Sales Mgr—Chemical Dept
Atlanta 9 Ga, 1430 W Peachtree St — TR 5-5642
Boston 10 Mass, 140 Federal St — HA 6-1668
Chi 1 Ill, Prudential Plaza — SU 7-3214
L A 15 Cal, 714 W Olympic Blvd — RI 9-9157
N Y 17 N Y, 415 Madison Ave — TE 8-8600

For additional information on products, services, and prices, use the enclosed Business Reply Cards.



Alkylates

Catalytic Cracking

Catalytic Reforming

Complete Oil Refineries

Ammonia

Butadiene

Vinyl Chloride

Dibasic Acids

Fatty Acid Nitriles

Isotrons

Phenolic Resins

Polyester Resins

Polystyrene Resins

Urea

Columbium

Gold

Nickel

Thorium

Titanium

Titanium Tetrachloride

Uranium

B F Goodrich Industrial Products Company
Division of the B F Goodrich Company
Akron O, 500 S Main St, C O DeLong, Pres BL 3-1171
R V Yoke, V P—Sales
Representatives in Principal Cities

✓**Goslin Birmingham Manufacturing Company Incorporated**
Birmingham 1 Ala, 3521 Tenth Ave N, John W Little, Pres 54-7511

Goulds Pumps Incorporated
Seneca Falls N Y, 300 Fall St, N J Gould, Pres 354
E E Backlund, Sales Mgr
Atlanta Ga, 15 Peachtree Pl N W, W C Henry TR 6-7378
Brookline 46 Mass, 1330 Beacon St, C R Brower BE 2-7640
Chi 4 Ill, 53 W Jackson Blvd, J B Darden HA 7-1301
Houston 2 Tex, 2314 Main St, T G Kelley JA 9-2685
N Y 7 N Y, 11 Park Place, A W Woodbury BA 7-7362
Phila 31 Pa, 2099 N 63rd St, G B Griffen TR 7-8760
Pgh Pa, 104 Sixth St, P A Thompson AT 1-0595
Portland Ore, 1919 N W Thurman St, R W Clarke CA 8-3755
Tulsa 6 Okla, 543 E Apache St, J P Lonberger GI 7-7171

Graff Engineering Corporation
Dallas 6 Tex, 413 Meadows Bldg, R A Graff, Pres EM 8-3760
Lucius Hannon Jr, Sales Mgr

Graphic Systems
N Y 36 N Y, 55 W 42nd St, Hines Hatchett, Pres WI 7-8444

Graver Construction Company Incorporated
N Y 17 N Y, 424 Madison Ave, H C Pitcher, Genl Mgr MU 8-6149
S D Barr, Genl Sales Mgr
Houston Tex, Box 1764, S J Jones Jr WA 6-1764
Joliet Ill, Box 1165, Martin H Swanson JO 6-6179
Wilmington Del, Box 308 OL 8-6431

✓**Graver Tank & Manufacturing Company Incorporated**
E Chi Ind, 4809 Tod Ave, E N Gosselin, Pres SA 1-7050
H J D'Aragon, Genl Sales Mgr; D R Rhoades, Eastern Sales Mgr; W H Dwyer Jr, Gulf Coast Sales Mgr; P H Leussler, West Coast Sales Mgr; J E Fogarty, Mid-Continent Sales Mgr
Abington Pa 1215 Old York Rd (Phila) TU 7-1111
Chi 4 Ill, 332 S Mich Ave WA 2-8893
Det Mich, 2591 W Grand Blvd TR 5-5300
Edgemoor Del, 100 Locke Rd OL 8-6431
Houston Tex, 5343 McCormick St WA 6-1763
Joliet Ill, Theodore & Rubberoid Rds JO 6-6179
L A 17 Cal, 1250 Wilshire Blvd MA 9-1780
N Y 17 N Y, 424 Madison Ave MU 8-8181
Pgh 19 Pa, 330 Grant St AT 1-3894

Graver Water Conditioning Company
N Y 11 N Y, 216 W 14th St, H T Sulcer, Genl Mgr WA 4-2321
V J Calise, Sales Mgr
Boston Mass, 6 Beacon St, W A Homer CA 7-9414
Chi 4 Ill, 332 S Mich Ave, D M Spilane WA 2-8893
Cinn 38 O, 3247 Corrine Ave, A H Huneck MO 1-4335
Cleve 14 O, 1103 Citizens Bldg, A H Huneck TO 1-0080
Det 35 Mich, 17590 Jas Couzens Hwy, A Wilcox UN 4-7013
Phila 12 Pa, 1041 Com Trust Bldg, R H Scheneker RI 6-8611

The Green Fuel Economizer Company Incorporated
Beacon N Y 627 Main St Allan Davies, Pres 316
G V Eiserman, Sales Mgr
Representatives in Principal Cities

Grinnell Company Incorporated
Prov 1 R I, 260 West Exch St, James D Fleming, Pres DE 1-5800
C J Haugum, Sales Mgr Supply; O L Swats, Sales Mgr Fire Prot
Atlanta 2 Ga, 645 Northside Dr N W, C W Thrash JA 4-6701
Billinas Mont 13 N 23rd St, J S Leland 9-4567
Buff 6 N Y, 1374 Clinton St, H J Meinhold FA -6111
Chi 9 Ill, 4425 S Western Ave, G R Nicolai VI 7-1500
Cinn 29 O, 3253 Fredonia Ave, E P Wolford UN 1-7772
Cleve 3 O, 1294 E 55th St, R J Riblet HE 1-4311
Dallas 2 Tex, 161 Glass St, J E Hatt RI 8-3351
Denver 2 Colo, 2175 15th St, W G Dalziel TA 5-7181
Fresno 1 Cal, 3081 Hamilton Ave, R L Olson 3-7226
Houston 1 Tex, 1121 Rothwell St, A D Pace CA 4-9763
K C 16 Mo 2316 Burlington Ave, R W Smith BA 1-3010
Long Brh 10 Cal 1360 W Pacific Coast Hwy, J S Tedford HE 7-6417
L A 13 Cal, 520 Mateo St, K Kettmann MU -5151
Milw 3 Wis, 1819 W St Paul Ave, J F Kaercher WE 3-7040
Mols 15 Minn 623 Wash Ave S, H J Ruddy FE 2-0321
N O 25 La, 7136 Wash Ave, L G Charbonneau GA -3125
N Y 17 N Y, 347 Madison Ave, E J Morris LE 2-5440
Phila 34 Pa, Erie Ave & D St, G J Robie GA 6-9500
Pocatello Idaho, 650 S 1st Ave, R T Norman 1335
Port 10 Ore, 3240 NW 29th Ave, A D Dalziel CA 3-7101
Sacramento 14 Cal 615 Seventh St, C K Knudsen GI 1-6901
St Louis 10 Mo, 1615 S Kingshighway, Q H Peckman PR 1-4925
San Fran 7 Cal, 601 Brannan St, G D Martin GA 1-6700
San Jose Cal, 50 Bellevue Ave, E F Thomas CY 7-1260
Santa Barbara Cal, 305 E Haley St, R W Brown WO 5-7027
Seattle 1 Wash, 3101 Elliott Ave, E J Nelsen GA -8440
Spokane 3 Wash, E 909 Sprague Ave, H O Darnell RI 7-6023

Griscom-Russell Company
Massillon, Ohio 2-7421
Chi 6 Ill, 20 N Wacker Dr FR 2-0038
Houston 25 Tex, 1100 E Holcombe Blvd JA 3-7483
N Y 17 N Y, 285 Madison Ave LE 2-3431
Phila 10 Pa, 1317 Land Title Bldg RI 6-1880
Schenectady N Y, 171 Jay St FR 7-7011

Guiberson Corporation
Dallas 21 Tex, 1000 Forest Ave, Gordon G Guiberson, Pres HA 1-4101
Harry S Zane Jr, Sales Mgr
Representatives in Principal Cities

B F Gump Company
Chi 50 Ill, 1325 S Cicero Ave, Ralph E Williams, Pres BI 2-3050
M F Frankel, Sales Mgr

H

✓**D W Haering & Company Incorporated**
San Antonio Tex, Box 6037 Harlandale Sta WA 2-1235
V W Haering, Pres; E H Snyder, Sales Mgr

Hagan Corporation
Pgh 30 Pa, 323 Fourth Ave, W W Hopwood, Pres CO 1-4722
John E Duesing, Sales Mgr
Buffalo 2 N Y, 220 Delaware Ave MA -9174
Cinn 2 O, 138 E Court St MA -0057
Denver 15 Colo, 7580 W 16th Ave BE 7-2729
Detroit 35 Mich, 15623 W McNichols Rd VE 5-8336
Grandview Mo, 504 Main St SO 1-2035
Lombard Ill, 211 Main St HA 7-1743
Pgh 30 Pa, 323 Fourth Ave CO 1-4722
Portland 6 Ore, 4803 S E 52nd Ave PR 5-5248
San Fran 11 Cal, 200 Davis St SU 1-7961
South Gate Cal, 3040 Tweedy Blvd LO 7-2384

Hallikainen Instruments
Berkeley 10 Cal, 1341 7th St, K E Hallikainen, Pres LA 4-1757
E F Schimbor, V P—Sales
Representatives in Principal Cities

Hamer Valves Incorporated
Long Beach 6 Calf, 2919 Gardenia, L S Hamer, Pres GA 7-5491
Cleo Williamson, Sales Mgr
Representatives in Principal Cities

✓**Hammarlund Manufacturing Company Incorporated**
N Y 1 N Y, 460 W 34th St, Lloyd Hammarlund, Pres LO 5-1300
F F Sylvester, Genl Sales Mgr
Representatives in Principal Cities

Hammel-Dahl Company
Prov 5 R I, Warwick Ind Pk, Edward T Dahl, Pres ST 1-6200
John R Curran, Vice Pres—Sales
L A 22 Cal, 5012 E Wash Blvd, Thos H Ponton AN 2-8970
N Y 17 N Y, 12 E 41st St, Harold M Miller MU 3-6729
Tulsa 3 Okla, 310 Thompson Bldg, Paul E Bowler DI 3-3365
Wilmington 1 Del, 1000 Wash St, John E Charsha Jr OL 2-6694
Representatives in Principal Cities

✓**Hammond Iron Works**
Warren Pa, 630 Fifth Ave, R Y Kopf, Pres 1150
R E Kramer, Sales Mgr
Birmingham 8 Ala, Box 8641 Ensley Sta, Max G Walker 574431
Bristol Pa, Box 23, Wm A Gery WI 5-0250
Casper Wyo, Box 479, Dale Hardy CA 2-1591
Provo Utah, Box 310, Dale Hardy FR 3-8150
N Y 20 N Y, 630 Fifth Ave, E H Bodinson CI 7-0617
Warren Pa, Box 660 Fred J Myers 1150

Hanna Engineering Works
Chi 22 Ill, 1765 Elston Ave, J C Hanna, Pres BR 8-2710
D L Shanks, Sales Mgr
Representatives in Principal Cities

Hanny Company The
Tulsa Okla, 310 E 10th St, P O Dr 770 L C King, Pres LU 5-9175
Chas C Stanley, Sales Mgr Cooling Div
Ellinwood Kans, 416 E Santa Fe, G R Bristow 266
Ft Worth Tex, 804 Neil P Anderson Bldg, Edgar Allan ED 6-2514
Midland Tex, 4313 Mercedes Dr, B H Holbert MU 4-4256
Odessa Tex, 1307 W Second, H Don Brinson FE 2-6417
Salem Ill, 504 Indiana, Geo Huff 1443-W
Seminole Okla 803 State St, H R Ashworth 391
Tulsa Okla, 310 E 10th, R F Snowden LU 5-9175
Wichita Falls Tex, 2602 10th St, B F Shelton 3-1635

Hardinge Company Incorporated
York Pa, 240 Arch St, Harlowe Hardings, Pres 5491
R J Russell, V P—Sales
Chi Ill, 205 W Wacker Dr FR 2-4182

For additional information on products, services, and prices, use the enclosed Business Reply Cards.

N Y N Y, 122 E 42nd St OX 7-3590
Salt L City U, 333 W 14th So St HU 4-5151
San Fran Cal, 24 Col St YU 2-6920

Harris Engineering Company
Dallas Tex, 1214 Davis Bldg, J B Harris, Pres RI 2-6096

✓Harshaw Chemical Company
Cleve 6 O, 1945 E 97th St, Charles S Parke, Pres RA 1-8300
W Wendell Lawson, VP Sales
Chi 32 Ill, 4925 S California Ave RE 7-1008
Cinn 13 O, 6265 Wiehe Rd RE -9100
Det 28 Mich, 9240 Hubbell Ave VE 6-6300
Houston 11 Tex, 6622 Supply Row WE -1628
L A 22 Cal, 3237 S Garfield Ave RA 3-3161
Phila 48 Pa, Jackson & Swanson Sts HA 2-4700
Pgh 22 Pa, 6 St & Fort Duquesne Blvd AT 1-7930

Hartzell Propeller Fan Company, Division Castle Hills Corp
Piqua O, 910 Downing St, Robert N Hartzell, Pres 850
E C Englert, Sales Mgr
Representatives in Principal Cities

Harvey Aluminum Company
Torrance Cal, 19200 S Western Ave, Leo M Harvey, Pres NE 6-2111
Atlanta Ga, 1430 W Peachtree St NW, Chas F Menser TR 5-8376
Berkeley Cal, 2020 Milvia St TH 5-3133
Dallas Tex, 3918 Harry Hines Blvd, Art G Bauer LA 6-7413
Det Mich, 16244 James Couzens Hwy UN 4-1030
Oak Park Ill, 6429 W North Ave CO 1-5043
St Louis Mo, 2 Brentwood Blvd VO 3-3445
Seattle Wash, 550 Mercer St AL -4991

Hauck Manufacturing Company
Brklyn 15 N Y, 124 10th St, M E C Gerdes, Pres SO 8-7309
D S Clark, Engrg Sales Div; V D Billings, Equipt Div

Haveg Corporation
Wilmington 8 Del, 900 Greenbank Rd, Dr John H Lux, Pres WY 8-2271
J W Carrow, Sales Mgr
Atlanta 5 Ga, 3230 Peachtree Rd N E, W O Gordon CE 7-3821
Cleve 20 O, 16104 Kinsman Rd, H D Barton WA 1-8700
Houston 4 Tex, 4101 San Jacinto, R A Wilkens JA 2-6840
L A 14 Cal, 530 W Sixth St, R E Cunningham MU -1105
Westfield N J, 101 Central Ave, E P Mampe & J M Ward WE 2-7383
Wheaton Ill, 130 W Liberty Dr, A V Ratcliffe WH 8-3225
Wilm 8 Del, 900 Greenbank Rd, J H Leary & J M Brady WY 8-2271

Haynes Stellite Co, Div of Union Carbide and Carbon Corp
Komomo Ind, 725 S Lindsay St GL 2-5421
See Union Carbide and Carbon Corp listing for Branch Offices

Hazard Wire Rope Division, American Chain and Cable Company
Wilkes-Barre Pa, 271 S Penna Ave, C N Johns, Pres
E H Todd, Sales Mgr
Houston 1 Tex, 630 McFarland St, H S Frady WA 3-2661

Heat-X Incorporated, Division of Dunham-Bush Incorporated
Brewster N Y, 1000 Mountain St, Cecil Boling, Pres
James A Mulcahey, Sales Mgr
Atlanta Ga, 1818 Sheridan Rd N E, Joe Parker ME 4-2451
Chi Ill, 317 W Huron St MO 4-4735
Houston Tex, 2015 S Shepard Dr JA 3-1767
Jenkintown, Pa, 301 York Rd (Phila) TU 7-7550
N Y N Y, 250 E 43rd St MU 9-2650
Riverside Cal, 1850 Mass Ave OV 3-0420
St Louis Mo, 4060 W Pine Blvd WO 1-1170
San Fran Cal, 760 Market St EX 2-7382

Wyatt C Hedrick Engineering Corporation
Houston 1 Texas, Box 1133, G M McGranahan, Pres JA 3-4451

Helicoid Gage Division, American Chain and Cable Company
Bridgeport 2 Conn, C N Johns, Pres 5-0161
V E Lysaght, Sales Mgr

Hendrick Manufacturing Company
Carbondale Pa, Dundaff St, K H Calville, Pres 1600
T A Warner, Genl Sales Mgr
N Y 7 N Y, 30 Church St BA 7-1728

Hercules Filter Corporation
Hawthorne N J, 175 Ethel Ave, Chas E Hunziker, Pres 7-6900
H T Jones Jr, Mgr Home Office
Los Angeles 48 Cal, 136 N Orlando Ave, E J Brinkmeyer WE 4-8347
Oak Park Ill, 1037 Wisconsin Ave, E F Daly EU 3-5109

Hetherington & Berner Incorporated
Indianapolis 7 Ind, 701 Kentucky Ave, Robert Berner, Pres ME 2-9354
Frank J Wallace, Mgr Industrial Sales
Representatives in Principal Cities

Hewitt-Robins Incorporated
Stamford Conn, 666 Glenbrook Rd, Thomas Robins Jr, Pres DA 4-1152
F L Griffith, Sales Mgr Ind Products
Birmingham Ala, 3118 3rd Ave S, Claude Andrews 4-8765
Boston 22 Mass, 69 Tenean St, F W Kayser AV 2-5400
Chi 6 Ill, 402 W Randolph St, L C Holloman DE 2-4570
Cleve 14 O, 314 Superior Ave N E, A J Ball SU 1-8020
Hibbing Minn, 718 E Howard St, C R Phillips HI 3-9109
Houston 11 Tex, 5711 Navigation Blvd, J W Pew WA 6-3193
L A 22 Cal, 2604 S Malt Ave, G V Migula RA-3-4771
N Y 17 N Y, 370 Lexington Ave, N M Godfrey MU 6-2400
Phila 25 Pa, Coral & Hagert Sts, J T Sheldon GA 6-2564
Pgh 19 Pa, 966 Union Trust Bldg, J R Fuller AT 1-5548
St Louis Mo, 4030 Chouteau Ave, A S Purmort JE 5-8240
Salt L City U, 545 W 8 So St, J E Van Stone EL 9-8731
San Fran 4 Cal, 1204 Russ Bldg, T C Zinter EX 2-4060

Hilliard Corporation
Elmira N Y, 209 W 4th St, E A Mooers, Pres EL 3-7121
T A LaBrecque, Sales Mgr Purifier Div
J H Fassett, Sales Mgr Clutch Div
Representatives in Principal Cities

Hills-McCanna Company
Chi 18 Ill, 3023 N Western Ave, C A Howe, Pres GR 2-1150
C Kuhn, Genl Sales Mgr
Representatives in Principal Cities

Hobart Brothers Company
Troy O, Hobart Square, E A Hobart, Pres FE 2-1223
E C Galbreath, Sales Mgr
Representatives in Principal Cities

Hoke Incorporated
Englewood N J, 148 S Dean St, W O Teeters, Pres EN 3-9100
E B Hitchcock, Sales Mgr
Sales Representatives in Principal Cities

Homelite, Division of Textron Incorporated
Port Chester N Y, Riverdale Ave, Box 134, J A Abbott, Pres WE 9-3400
Robert Straetz, Sales Mgr JE 1-8800

Homestead Valve Manufacturing Company
Corapolis Pa, Box 345, F E Schuchman, Pres AM 4-3240
Ken Gorton, Sales Mgr—Valve Div

Hooker Electrochemical Company
Niagara Falls N Y, 9 Iroquois St
R E Wilkin, V P—Dir of Sales
Chi 2 Ill, 1 N LaSalle St CE 6-1311
L A 5 Cal, 3325 Wilshire Blvd DU 5-4404
N Y 17 N Y, 60 E 42nd St MU 2-2500
Tacoma 1 Wash, 605 Alexander St FU -2661

Houdry Process Corporation
Phila 2 Pa, 1528 Walnut St, T A Burtis, Pres PE 5-9490
R E Bland, Process Sales; J W Schall, Catalyst Sales;
P A Burghart, Chemical Sales

Howe-Baker Corporation
Houston Tex, 503 Bank of the Southwest Bldg FA 3-9126
G B Hanson, Pres; R J Phillips, Sales Mgr, Treating

Hudson Engineering Corporation
Houston 6 Tex, Box 6158, E J Hudson, Pres JA 9-4261
Herman Urech, Cooling Equipt Sales
L A 57 Cal, 2500 W Sixth St, Lester Oberholtz DU 8-1339
N Y 17 N Y, 405 Lex Ave, Ed Reichheim MU 7-1845

✓Humble Oil & Refining Company
Houston 1 Tex, Box 2180, Hines Baker, Pres JA 9-0443
F A Watts, Sales Mgr
Abilene Tex, Box 180, R T Holmes 8511
Dallas 25 Tex, Box 12068, George Wilmoth EM 1-7163
Houston Tex, 1020 Holcombe Blvd, A O Saenger JA 9-0443
San Antonio Tex, 900 N E Military Dr, H A Lillja TA 4-1421

Hungerford & Terry Incorporated
Clayton N J, 226 Atlantic Ave, Churchill Hungerford, Pres TU 1-3200
Sereno F Alling, Sales Mgr
Arlington 9 Va, 1500 Arlington Blvd, D M Hungerford JA 7-3672
Charlotte N C, 3400 Eastway Dr, H H Hungerford ED 4-2263
N Y 17 N Y, 342 Madison Ave, Granville Lang & C A Ogg MU 2-3649
Representatives in Principal Cities

Husky Oil Company
Cody Wyo, Box 380

Hynes Electric Heating Div, Turbine Equipment Company
Mountainside N J, Box 578, Rt 22 WE 2-5354
Leroy A Mortenson, Sales Mgr
Buff 15 N Y, 3060 Bailey Ave, E D Bradley WI -6237
Boston Mass, 80 Federal St, H A Reynolds LI 2-5993
N Y 7 N Y, 63 Vesey St, P E Linthwaite WO 4-0666

Hyster Company
Port 8 Ore, 2903 N E Clackamas St, E G Swigert, Pres AT 8-5011
Phil S Hill, V P—Sales
Danville Ill, 1011-19 Myers St, James L Woodley 6-2400
Peoria Ill, 1803-19 N Adams St, W M Campbell 3-4411
Representatives in Principal Cities

I

Illinois Clay Products Company
Joliet Ill, 68 N Chicago St, Howard F West, Pres 5308

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George J Biddle, Sales Mgr
Chi 3 Ill, 208 S LaSalle St ... BI 2-3084

Illinois Testing Laboratories Incorporated
Chi 10 Ill, 420 N La Salle St, J A Obermaier, Pres ... WH 3-1331
Martin J Rauscher, Sales Mgr

Imperial Brass Manufacturing Company
Chi 7 Ill, 1200 W Harrison St, F C Shafer, Pres ... HA 1-0740
C H Benson, V P—Sales Mgr

Independent Filter Press Company Incorporated
Brooklyn 20 N Y, 240-48th St, Abraham Schulman, Pres ... GE 9-5774
Maurice J Sayles, Sales Mgr

Indiana Commercial Filters Corporation
Lebanon Ind, 940 6th St, C I Wallace, V P—Genl Mgr
C F Holland, Mgr
Oak Park, Ill, 6409 N Ave, P R Motravers ... VI 8-9300
Ridgefield, N J, 663 Grand Ave, Arthur Poole ... MO 6-8490

Industrial Crane & Hoist, Ingersoll Prod Div, Borg-Warner Corp
Chi 8 Ill, 1536 S Paulina St, M R McLary, Pres ... MO 6-1350
R T Gustafson, Sales Mgr
Birm 5 Ala, 208 Towne House, J L Billmeier ... 53-1669
Det 35 Mich, 18431 Jas Couzens Hwy, L W Bellley ... UN 4-5146
Newark N J, 60 Park Place, M A Bravette ... MA 3-8032

Industrol Corporation
Roselle Pk N J, 472 Westfield Ave E, G R Feeley, Pres ... CH 5-8400
Edw M Feeley, Sales Mgr
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Infilco Inc
Tuscon Ariz, 901 S Campbell Ave, P N Engel, Pres ... MA 3-5401
E G Komwek, Genl Sales Mgr
Representatives in Principal Cities

Ingersoll-Rand Company
N Y 4 N Y, 11 Bwy, R H Johnson, Pres ... DI 4-6070
H G Conkey, Genl Sales Mgr
Atlanta 5 Ga, 3131 Maple Dr NE ... EX -2170
Balt 3 Md, Light & Redwood Sts ... PL 2-0380
Beaumont Tex, 2510 Bwy ... TE 3-3912
Birmingham 3 Ala, 1700 3rd Ave S ... 53-2576
Boston 16 Mass, 285 Columbus Ave ... KE 6-2280
Buff 2 N Y, 117 W Chippewa St ... CL -6437
Butte Mont, 845 S Montana St ... 2-0451
Chi 6 Ill, 400 W Madison St ... DE 2-4626
Cinn 6 O, 428 McGregor Ave ... PL 1-8060
Cleve 3 O, 4506 Chester Ave ... EX 1-9889
Corpus Christi Tex, 641 Wilson Bldg ... TU 2-7861
Dallas 1 Tex, 1728 Canton St ... RI 7-8311
Denver 2 Colo, 1641 Blake St ... KE 4-2245
Det 26 Mich, Congress at First ... WO 3-5504
El Paso Tex, 2100 Wyoming St ... 2-3673
Houston 3 Tex, 2109 McKinney Ave ... CA 8-3411
K C 6 Mo, 1012 Balt Ave ... VI 2-9325
Knox 24 Tenn, 412 W Jackson Ave ... 3-3145
L A 33 Cal, 1460 E 4th St ... AN 8-6761
Mpls 4 Minn, 2020 Snelling Ave ... FE 9-7005
Newark 12 N J, 899 Frelinghuysen Ave ... BI 8-3380
N O 25 La, 960 S Genois St ... AU -0885
N Y 4 N Y, 11 Bwy ... DI 4-6070
Phila 3 Pa, 2037 Chestnut St ... LO 7-7535
Picher Okla, 266 West A St ... PI - 304
Pgh 22 Pa, 932 Penn Ave ... AT 1-9070
Port 5 Ore, Bwy Bldg ... CA 3-1852
Salt Lake City 1 U, 144 S W Temple St ... DA 8-8127
San Fran 7 Cal, 350 Brannan St ... GA 1-6330
Seattle 4 Wash, 526 1st Ave S ... MA -2866
St Louis 3 Mo, 2327 Locust Blvd ... GA 1-0888
Tulsa 20 Okla, 407 S Peoria Ave ... GI 7-0157

Insul-Mastic Corporation of America
Summit Ill, 7750 W 61st Pl, H L Stockdale, Pres ... GL 8-1616
Clifford N Cox, Sales Mgr

International Business Machine Corporation
N Y 22 N Y, 590 Madison Ave, Thomas J Watson Jr, Pres ... PL 3-1900
G E Jones, Sales Mgr Data Processing Div
P W Knaplund, Sales Mgr Spec Eng Prods Div
Offices in Principal Cities

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Dayton 1 O, 1145 Bolander Ave, R H McElroy, Pres ... AD -7275
Fred Haenzi, Sales Mgr Chem Process Div
N Y 38 N Y, 15 Park Row, A P Weber ... WO 2-2580

International Nickel Company Incorporated
N Y 5 N Y, 67 Wall St, H S Wingate, Pres ... WH 4-1000
L R Larson, V P—Genl Sales Mgr
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Edson K Green, V P—Sales
Offices in Principal Cities

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Cleveland 11 O, 3170 W 106th St, W F Strong, Pres ... OR 1-3500
S H Beach, Ind Sales Mgr
Bklyn N Y, 356 4th Ave, J R Sherwood ... MA 4-0307
Chi Ill, 1101 W Adams St, E W Jones ... MO 6-8000
Mad Wis, 740 Williamson St, N O Letvander ... AL 5-0062
Port O, 3205 S E 17th Ave, R W Brenneke ... BE 2-2121
St Louis Mo, 3114 Wash Ave, G V Baldwin ... OL 2-2211

Ironton Fire Brick Company
Ironton O, Box 536, Edw F Myers, Pres ... 109
James H Rickey Jr, V P—Sales Mgr
Representatives in Principal Cities

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Long Island City 1 N Y, 50-09 27th St, James E Irving, VP ... RA 9-8810
Louis F Fontana, Sales Mgr
Representatives in Principal Cities

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Burbank Cal, 703 S Main St, Allen M Goldstein, Pres ... VI 9-2273
J Leonard Shepherd, Sales Mgr

J

Jackson & Moreland Incorporated
Boston 16 Mass, 600 Park Sq Bldg, F M Carhart, Pres ... LI 2-9060
N Y N R, 19 E 47th St, A J Tigges ... PL 8-2646

Jarrell-Ash Company
Newtonville 60 Mass, 26 Farwell St, F Jarrell, Pres ... DE 2-2130
John Schuch, Genl Sales
Charles E Shuter, Asst Instrument Sales Mgr
Atlanta 9 Ga, 1430 Boulevard N E, Gene M Roberts ... TR 6-9020
Dallas 6 Tex, 4924 Greenville Ave, Arthur Edwards ... FO 8-5801
New York 33 N Y, 830 W 177th St, Alfred Month ... SW 5-9200
Pittsburgh 9 Pa, 916 Greenhill Rd, Michael S Slish ... TA 1-2990
San Mateo Cal, 664 Edna Way, Robert E Alvord ... FI 1-2814
Tinley Pk Ill, 17201 Oriole Ave, Peter B Whitcomb ... KE 2-4914

Jefferson Lake Sulphur Company
N O 12 La, 1408 Whitney Bldg, E H Walet Jr, Pres ... MA -6381
Charles J Ferry, Sales Mgr

C O Jelliff Manufacturing Corporation
Southport Conn, Pequot Rd, W F Wheeler, Pres ... FA 9-1616
Halstead Wheeler, Sales Mgr Woven Mesh Div
J C Gibbons, Sales Mgr, Resistance Wire Div

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Tulsa Okla, Box 3717, A C Jensen, Pres ... MA 6-3858
L R Van Arsdale, Sales Mgr
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Somerville 45 Mass, 87 Fellsway, Brooks Stevens Jr, Pres ... SO 6-7500
James A Ford, Sales Mgr
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Oak Lawn Ill, 5456 W 111th St, Jos Campanella, Pres ... VI 7-7811
P J Bell, Sales Mgr
Representatives in Principal Cities

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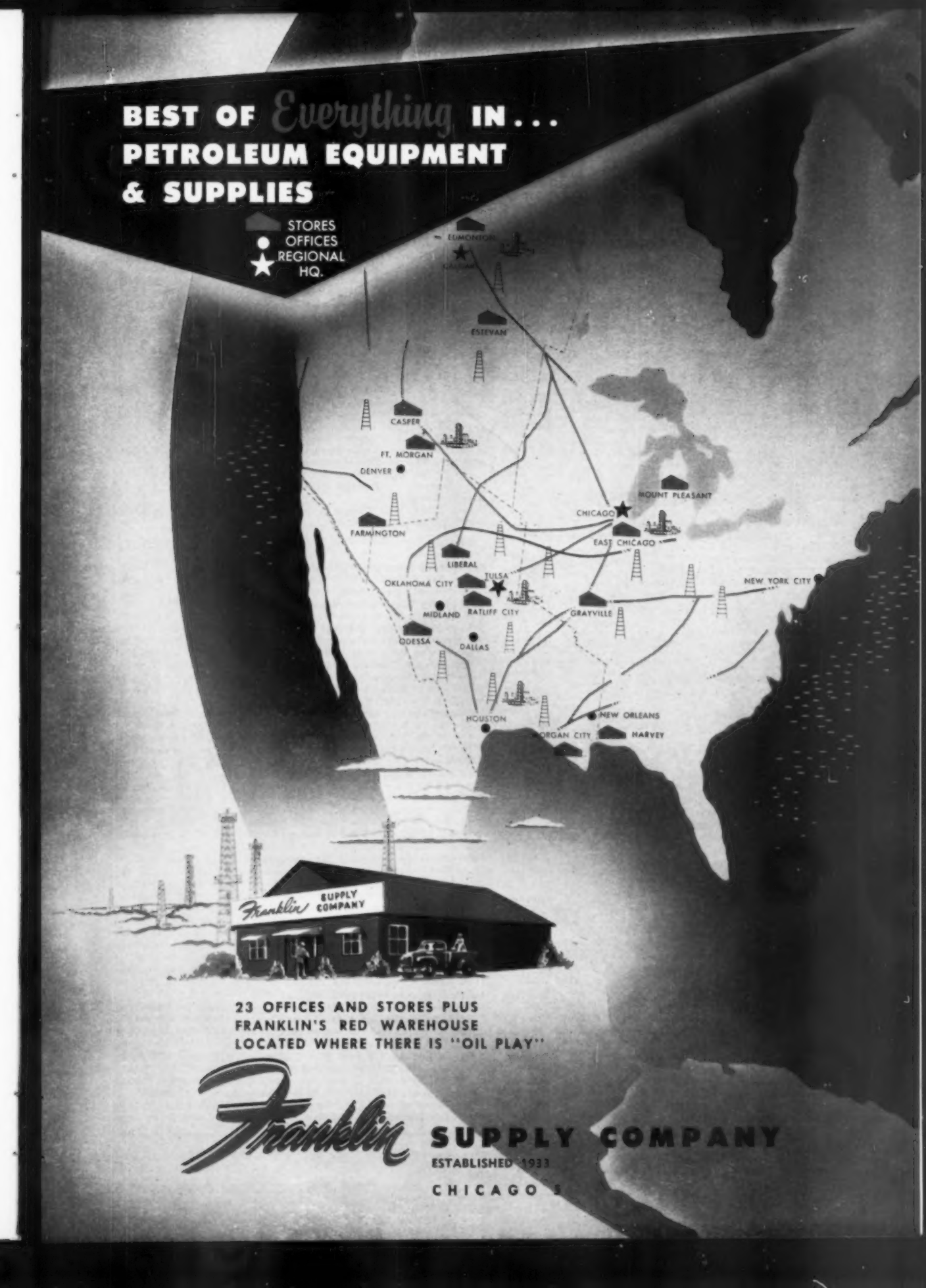
N Y 16 N Y, 22 E 40th St, A R Fisher, Pres ... LE 2-7600
W R Wilkinson, VP—Sales
Atlanta 3 Ga, 101 Marietta St, N W ... JA 5-2021
Boston 16 Mass, 100 Newbury St ... CO 7-6500
Chi 54 Ill, Mdse Mart Plaza ... DE 7-1144
Cinn 2 O, 510 American Bldg ... PA 1-5840
Cleve 15 O, Guildhall Bldg ... MA 1-5151
Denver 2 Colo, Can Oil Bldg ... KE 4-6378
Houston 4 Tex, 3115 Blodgett St ... JA 8-2483
L A Cal, 816 W 5th St ... MI -6011
Milwaukee 9 Wis, 4260 N Teutonia Ave ... UP 3-9220
N O 19 La, Pan Am Life Ins Bldg ... TU -0361
N Y 16 N Y, 270 Madison Ave ... LE 2-7600
Phila 6 Pa, Suburban Sta Bl ... RI 6-7850
Pgh 19 Pa, 2228 Koppers Bldg ... AT 1-4040
St Louis 5 Mo, 7912 Bonhomme Ave Clayton ... PA 1-4000
San Fran 5 Cal, 116 New Montgomery St ... DO 2-4353
Seattle 9 Wash, 777 Thomas St ... EL -8070

Johnson Gear & Manufacturing Company, Limited
Berkeley 10 Cal, 8th and Parker Sts ... TH 5-7376
G H Smith, Sales Mgr

Johnston Pump Company
Pasadena Cal, 3272 E Foothill Blvd ... RY 1-7601
Paul Chapman, Mgr Ind Sales
N Y N Y, 205 E 42nd St, Arthur D Apgar ... MU 4-7021
Roswell N M, Box 711, Fred La Turner ... MA 2-5942

For additional information on products, services, and prices, use the enclosed Business Reply Cards.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Tulsa Okla, 1421 S Sheridan, Rainey Elliott, Pres TE 6-1671
W L Wolfe, V P—Sales
Chi Ill, 135 S LaSalle St, L O Bass Jr FR 2-1764
Cleve O, 1409 Union Commerce Bldg, F W Durbin MA 1-7866
Dallas Tex, 1616 Republic Nat Bk Bldg, G A McDaniel RI 2-6426
Ft Worth Tex, 2112 Continental Life Bldg, R Z Dallas ED 5-3227
Pgh 30 Pa, 401 Liberty Ave, Gateway Ctr, F W Birmingham CO 1-7400

K

Kaiser Aluminum & Chemical Sales Corporation
Oakland 12 Cal, Kaiser Bldg, Henry J Kaiser, Pres TW 3-4600
S S Inch, VP Sales

Kaiser Engineers, Division of Henry J Kaiser Company
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New York 22 N Y, 300 Park Ave, Maurice Nicholls PL 9-1100
Pittsburgh 19 Pa, 330 Grant St, T F Smith AT 1-7992

M W Kellogg Company
N Y 17 N Y, 711 Third Ave, Warren L Smith, Pres OX 7-5200
R J Wolf, V P—Sales Mgr
Houston 2 Tex, 402 Esperson Bldg, W T McCoy CH 4-1846
San Fran Cal, 1407 Russ Bldg, W R Dunn YU 6-4979
Tulsa Okla, 506 Philtower Bldg, P Hughes GI 7-4047

C M Kemp Manufacturing Company
Balt 2 Md, 405 East Oliver St, J C Kimpel, Pres VE 7-1166
E J Funk Jr, Sales Mgr
Representatives in Principal Cities

The Kendall Company
Boston 10 Mass, 140 Federal St, Richard R Higgins, Pres HU 2-3030
John L McConchie, Sales Mgr

Walter Kidde & Company Incorporated
Belleville 9 N J, 675 Main St, John F Kidde, Pres PL 9-5000
P W Eberhardt V P—Ind & Marine Div
Atlanta Ga, 1200 Spring St N W, W K Winstead TR 5-8977
Chi Ill, 1310 W Randolph St, W E Healey SE 8-2724
Dallas Tex, 7224 Harry Hines Blvd, W R Elder FL 1-6466
Detroit 7 Mich, 3900 Grandy Ave, J E McAllister WA 3-5600
L A 16 Cal, 4845 W Exposition Blvd, F S Buckley RE 3-0158
Phila 4 Pa, 101 N 33rd St, T W Brooks BA 2-8181

Kieley and Mueller Incorporated
Middletown N Y, 65 Genung St, Joseph O'Connor, Pres MI 2-2526
Norman Lieblich, V P—Sales Mgr
Representatives in Principal Cities

Killark Electric Manufacturing Company
St Louis 13 Mo, 3940 Easton Ave, Joseph Desloge, Pres JE 1-0460
J C Grindell, Sales Mgr

King Engineering Corporation
Ann Arbor Mich, 3201 S State St, G W Willard, Pres NO 2-5651
G W Carlisle, Sales Mgr
Chi 34 Ill, 7009 W Belmont Ave, E M Piche ME 7-2570
Clev 9 O, 3432 Memphis Ave, J F Bartus ON 1-7010
Det 38 Mich, 12638 Woodrow Wilson Ave, Harold E Willard TO 8-2123
N Y 1 N Y, 1182 Brdwy, William E Tully MU 3-7128
Pgh 34 Pa, Box 10387, Mike J Debusschere LO 1-4208
St Louis 10 Mo, 4423 Manchester Ave, Martin Foeste JE 3-6030

Kinney Manufacturing Division
New York Air Brake Company, Boston 30 Mass JA 4-3220
Wm B Mills, Genl Sales Mgr
Boston 30 Mass, 3529 Wash St, D E Thomas Jr JA 4-3220
Cleve O, 240 E 305th St, G W Brewer WI 3-6800
LaGrange (Chi) Ill, 17 S LaGrange Rd, J L Zubler FL 2-1280
L A Cal, 5058 Venice Blvd, R A Woltman WE 8-7292
N Y 6 N Y, 90 West St, W T Chester WO 4-3580
Phila 7 Pa, 1638 Phila Natl Bk Bldg RI 6-5875

Klemp Metal Grating Corporation
Chi 38 Ill, 6697 S Melvina Ave, Lee Shelley, Pres PO 7-6760
Foster W Lamb, Sales Mgr
N Y 1 N Y, 350 Fifth Ave, E L Tarof LA 4-5188

Maurice A Knight
Akron 9 O, Box 111, M A Knight Jr, Pres PA 4-1277
E O Boedicker, Stoneware Sales Mgr
P G McDermott, Resins Sales Mgr
Houston 4 Tex, 4101 San Jacinto, Wm C Buchanan JA 8-2072
N Y 18 N Y, 130 W 42nd St, F M Klein CH 4-6145

✓Koch Engineering Company Incorporated
Wichita Kansas, 321 W Douglas Ave, Ranie H Love, Pres AM 7-3325
Griffin C Thrift, Sales Mgr
Houston Texas, Alpha Eng
N Y N Y, 295 Madison, Crawford Engineering
Park Ridge Ill, 1521 Courtland Ave, M B Fisher
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Pgh Pa, 501 Alcoa Bldg, D D Foster
Tulsa Okla, Wright Bldg, W C Myers

✓Koehring Company
Milw 16 Wis, 3026 W Concordia Ave, J R Steelman, Pres UP 3-4500
J E Chadwick, Sales Mgr
Representatives in Principal Cities

Koppers Company Inc
Pgh 19 Pa, Kopers Bldg EX 1-3300
J S Atwood, Spec Eng, Chem Dept

Koppers Company Incorporated, Chemical Division
Pgh 19 Pa, Koppers Bldg, J W Pool Jr, Sales Mgr EX 1-3300
Atlanta 3 Ga, 1029 Healey Bldg, Jones Sipe JA 4-7620
Boston 16 Mass, 250 Stuart St, M O Fullerton HA 6-1700
Chi 3 Ill, 122 S Mich Ave, Leo Diamond WE 9-2400
Detroit 26 Mich, 154 Bagley Ave, James Ferraro WO 3-3396
Haverford Pa, 355 E Lancaster Ave, James Roberts GR 7-9516
Houston 4 Tex, 4101 San Jacinto, Robert Bench JA 4-5975
L A 5 Cal, 3450 Wilshire Blvd, Walter E Wright DU 8-0576
N Y 22 N Y, 430 Park Ave, R F Seubert PL 5-2810
Pgh 19 Pa, Koppers Bldg, C J Snyder EX 1-3300
San Fran 5 Cal, 55 New Montgomery St, Walter E Wright DO 2-3364

✓Koppers Company Incorporated, Metal Products Division
Balt 3 Md, 200 Scott St, H B Cummings, V P—Genl Mgr SA 7-2500
H P Neher Jr, Sales Mgr
Chi 3 Ill, 122 S Mich Ave, John E Onnen WE 9-2400
N Y 22 N Y, 430 Park Ave, R J Green PL 5-2810
Pgh 19 Pa, 2320 Koppers Bldg, John Meyers EX 1-3300
San Fran 5 Cal, 55 New Montgomery St, John W Freund DO 2-3364

✓Kralov Plastic Pipe Company
L A 22 Cal, 4720 E Wash Blvd, Robert C Raab, Pres AN 1-4158
Representatives in Principal Cities

Kuljian Corporation
Phila 21 Pa, 1200 N Broad St, H A Kuljian, Pres ST 2-9000
Hilton A Levonian, Sales Mgr

L

Laboratory Equipment Corporation
St Joseph Mich, Box 151, Carl H Schultz, Pres YU 3-5534
Howard J Schmitt, Sales Mgr

Laboratory Glass & Instrument Corporation
N Y 31 N Y, 514 W 147th St, Joseph Buchler, Pres

✓Ladish Company, Fittings Division
Cudahy Wis, 5481 S Packard Ave, J F Hacker, V P HU 1-1500
Atlanta Ga, Miller Bldg, R N Yeakle TR -8855
Buffalo 3 N Y, The Rand Bldg, J B Slater CL -6477
Chi 4 Ill, McCormick Bldg, J A Blaney HA 7-3290
Cleve 15 O, Hanna Bldg, H L Lowry TO 1-0642
Cudahy Wis, 5481 S Packard Ave, W P Frey HU 1-1500
Denver Colo, Mile High Ctr Bldg, G E Mahoney MA 3-5371
Houston 25 Tex, Prudential Bldg, J M Browning JA 4-7557
L A 58 Cal, 3321 E Slauson Ave, H L Pehrson LU 3-4681
N Y 17 N Y, Lincoln Bldg, R T Meek MU 2-7663
Odessa Tex, Phillips Petroleum Bldg, J G Henderson FE 7-6561
Phila 2 Pa, Broad-Locust Bldg, T J Mandes KI 5-5623
Pgh 19 Pa, Alcoa Bldg, D D Foster AT 1-0865
St Louis 8 Mo, Continental Bldg, W P Foley JE 5-4175
St Paul 14 Minn, 2200 Univ Ave, H H Rugg MI 5-3909
San Fran 11, Cal, Tilden Sales Bldg, A C Tracy YU 2-6360
Seattle 9 Wash, 314 Fairview Ave, N, W W Warren SE -0747
Tulsa Okla, Thompson Bldg, G H Loeffler LU 5-1291

Lapp Insulator Company, Incorporated
LeRoy N Y, 40 Gilbert St, R L Jenner, Pres 385
Brent Mills, V P—Sales
L F Wilson, Mgr, Process Equip Div
Representatives in Principal Cities

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Dayton 7 O, 2001 Home Ave, H W Faulkenaer, Pres ME -3591
Azusa Cal, 15601 Arrow Hwy, R F Mahurow, Plt Mgr ED 8-1185

Lawrence Pumps Incorporated
Lawrence Mass, 371 Market St, Victor J Mill, Pres 2-5249
Victor J Mill Jr, Sales Mgr

Layne & Bowler Incorporated
Memphis 8 Tenn, Box 6697 Hollywood Sta, W H Reeves, V P BR 5-1192
J G Gordon III, Sales Mgr
Houston 11 Tex, 5402 Lawndale Ave, O F Jensen WE -7603
K C 2 Mo, 1010 W 39th St, R O Joslyn WE -2353
Lake Charles La, 915 Front St, F R Gibson 9523
Linden N J, 1200 W Eliz St, W A North 2-3377
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Layne & Bowler Pump Company
L A 22 Cal, 2943 Vail Ave, Robert Charles, Pres
Clark Bower, Sales Mgr
Fresno Cal, Box 1229, Frank Shepherd AD 3-3214
Hastings Neb, Box 31, Harry Bonds 2-2835
Monroe La, Box 1238, Dan Lamb 3-0924
N Y 20 N Y, 30 Rockefeller Plaza, Jack Baumgarten PL 7-3821
Twin Falls Idaho, Box 892, Tommy Thompson 2651

Ledeen Manufacturing Company
El Monte Cal, Gilman Rd & Garvey Ave, Hyman Ledeen, Pres
Harold Rosoff, Sales Mgr
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H L Scutt, Mgr Eng Dept
N Cohn, Mgr Market Development Dept
Atlanta 5 Ga, 3084 Grandview Ave NE, W S Bloor CE 7-8624
Boston 66 Mass, 430 Lex St, E D Moiles LA 7-9360
Buff 2 N Y, Delaware Ave, W L Kimber WA-7823
Chi 1 Ill, 307 N Mich Ave, E A Yeo Jr CE 6-3428
Cinn 36 O, 8005 Plainview Rd, M S Nolen SY 1-2274
Cleve 6 O, 1922 E 107th St, W A Macan III SW 1-5100
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Denver 2 Colo, 1545 Glenarm Pl, W A Gneiser AC 2-1808
Det 35 Mich, 18240 James Couzens Hghwy, F D Burnett DI 1-2320
Houston 5 Tex, 2480 Times Blvd, R E Hansen JA 9-3423
Indpls 18 Ind, 3513 N Havey St, E E Tuttle WA 6-2462
K C 14 Mo, 7935 Al State Line Rd, T E Bradley JA 3-8199
L A 22 Cal, 5111 Via Corona Ave, G F Rucker AN 9-3191
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N Y 17 N Y, 711 Third Ave, P K Welch MU 7-4133
Phila 30 Pa, 444 N 16th St, J M Jackson MI 4-4900
Pgh 34 Pa, 300 Mt Lebanon Blvd, W H Neu LO 1-7808
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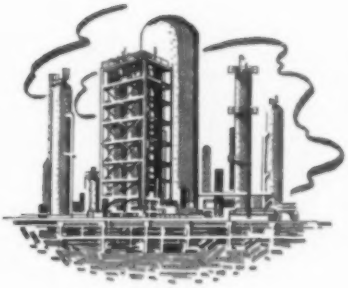

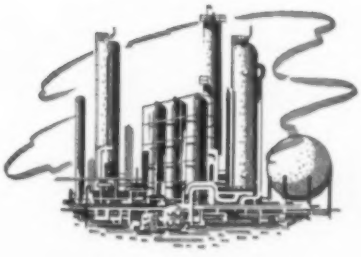

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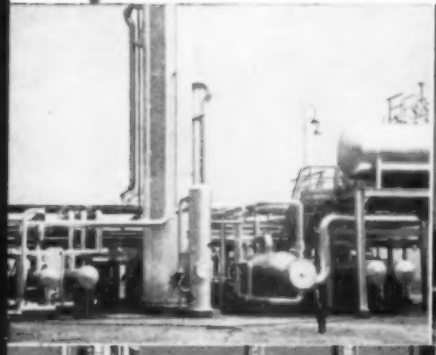

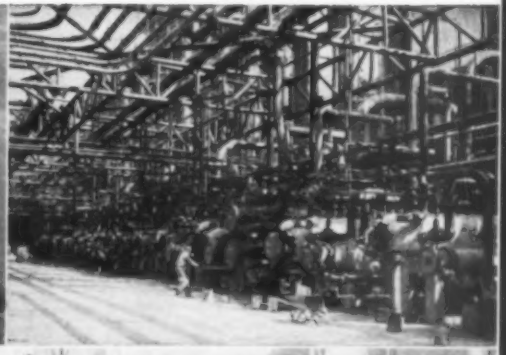

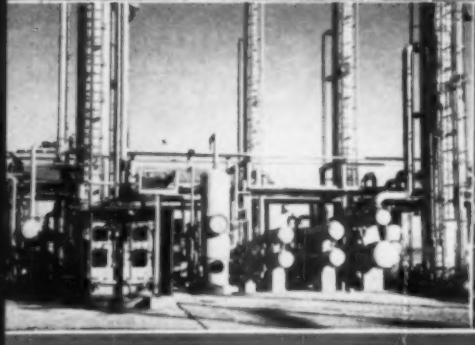

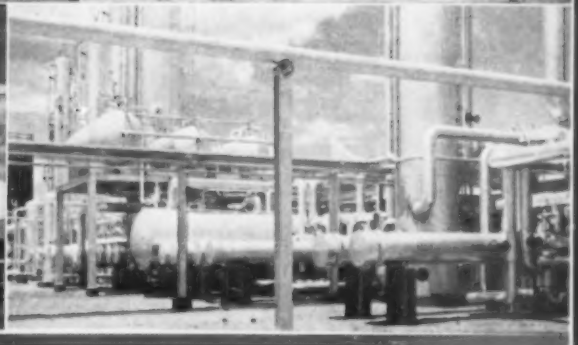

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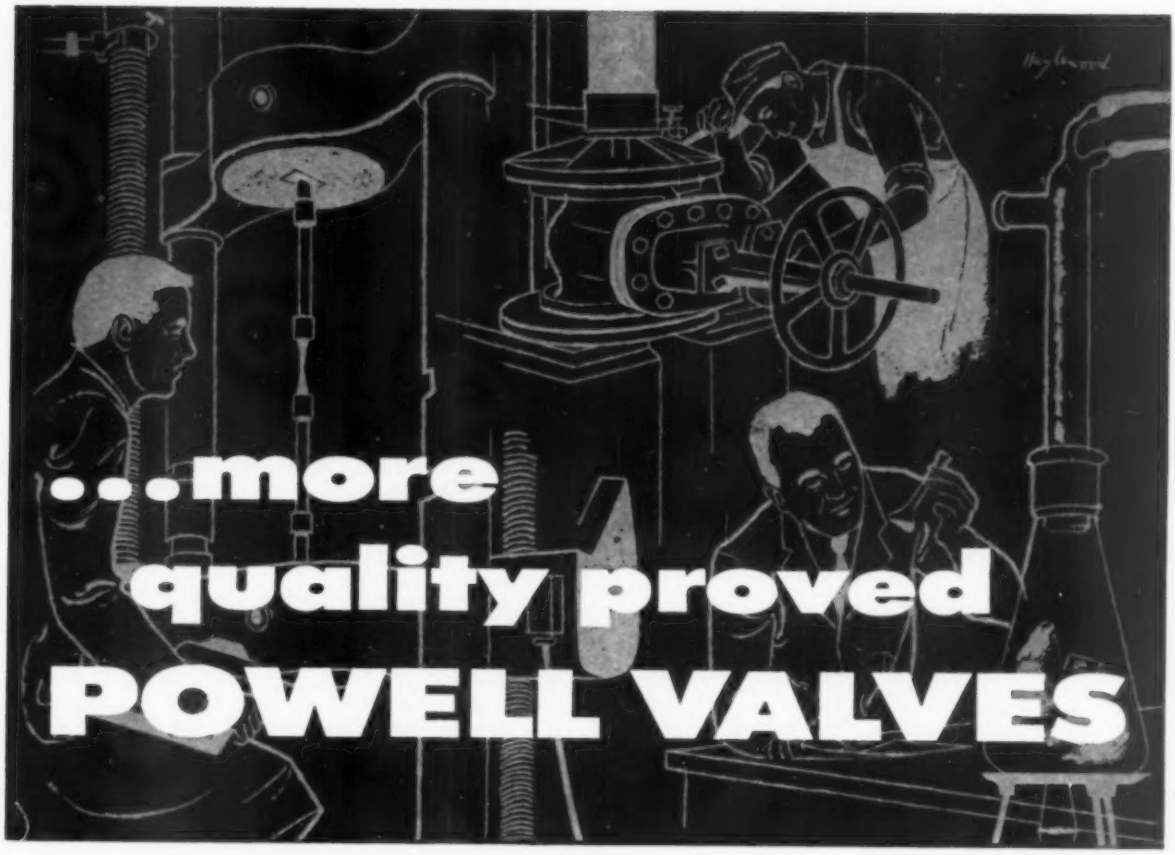
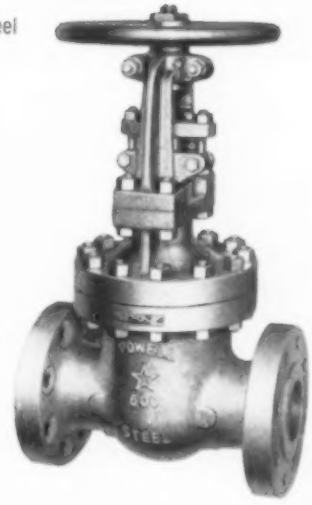


FIG. 375—Bronze "White Star" Gate Valve for 200 pounds W.S.P.

FIG. 2467—Stainless steel O.S. & Y. Gate Valve for 300 pounds W.P.

FIG. 6003—600-pound Steel O.S. & Y. Gate Valve

FIG. 3061—300-pound Steel Swing Check Valve



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Consult your Powell Valve distributor for full facts about quality proved bronze, iron, steel and corrosion-resistant valves. For every flow control problem—there is a Powell Valve to solve it.

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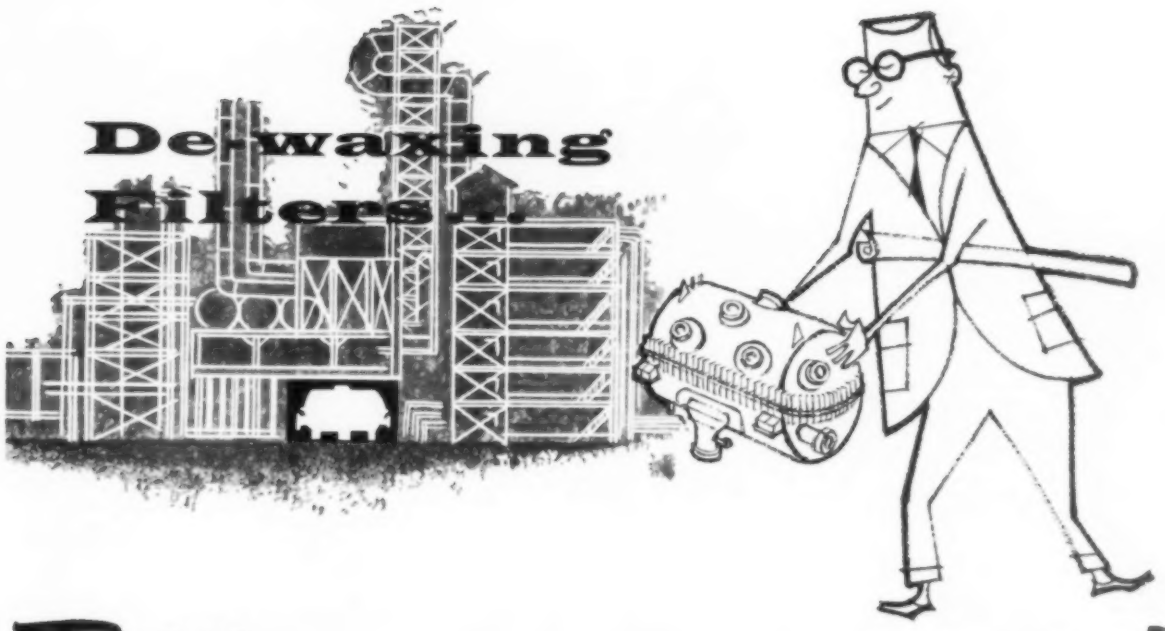

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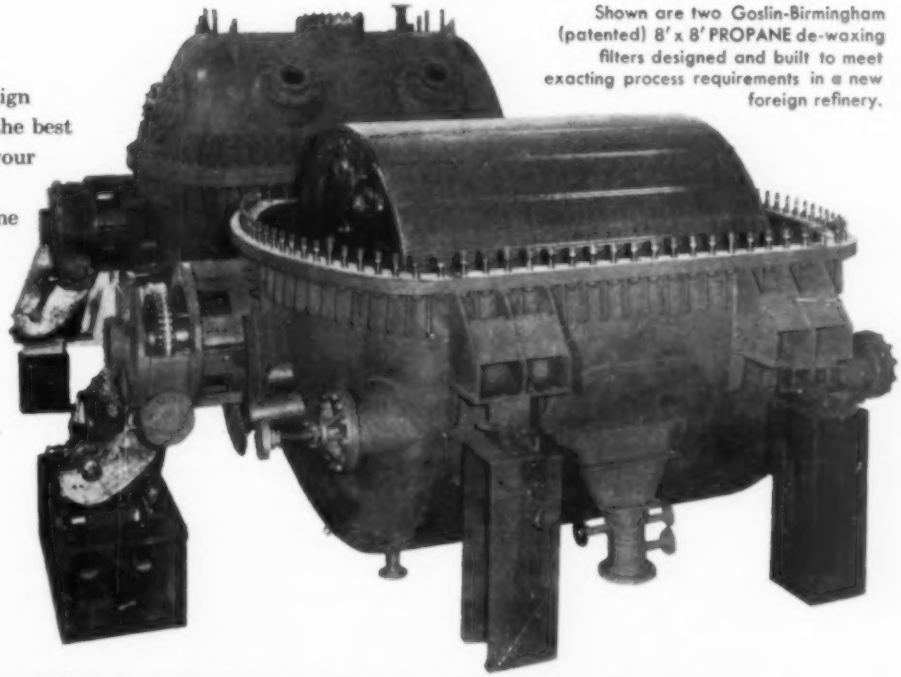

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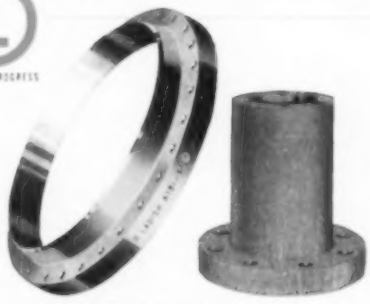

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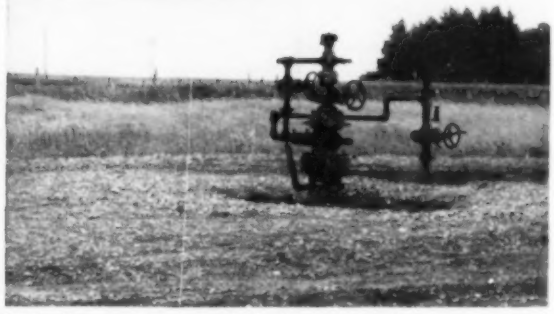
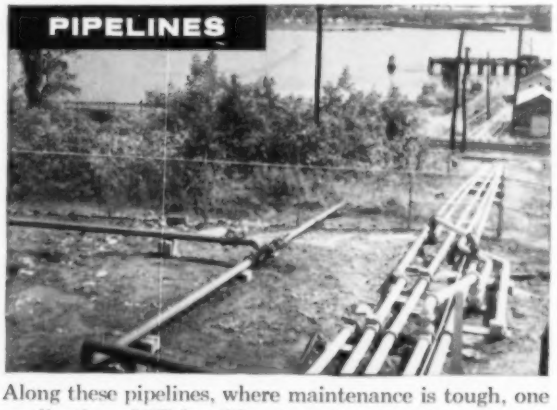


Note the excellent control of weeds and grasses around this wellhead from just one application of "Telvar."

TANK FARMS

The treated area around this tank farm has remained weed-free for an entire season.

PIPELINES



Along these pipelines, where maintenance is tough, one application of "Telvar" has kept the treated area weed-free for a year.

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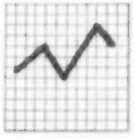

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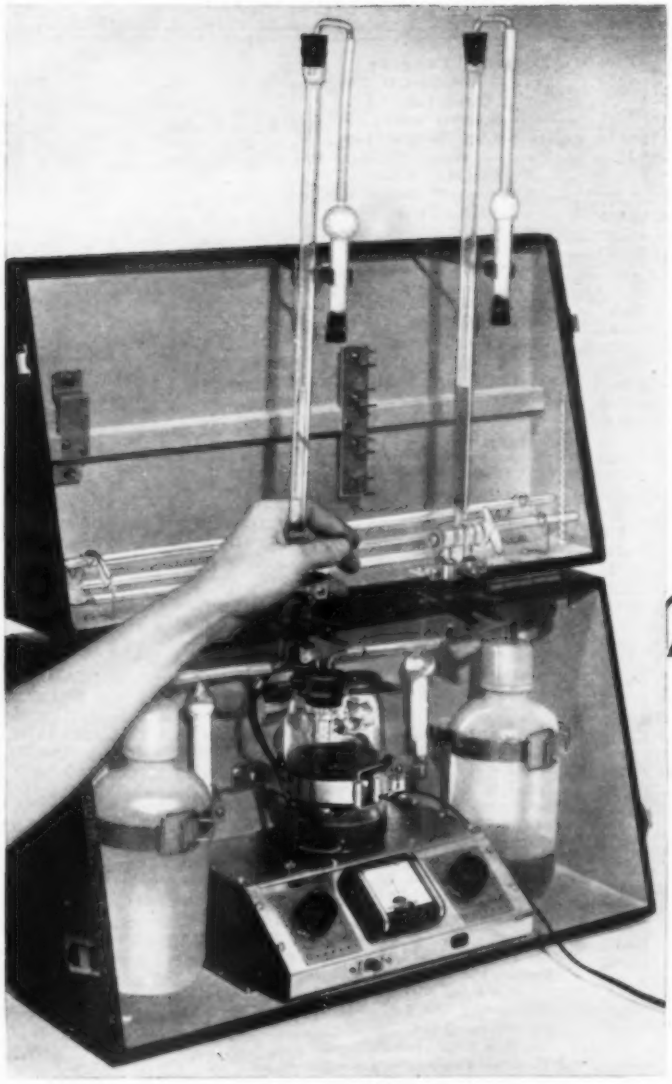

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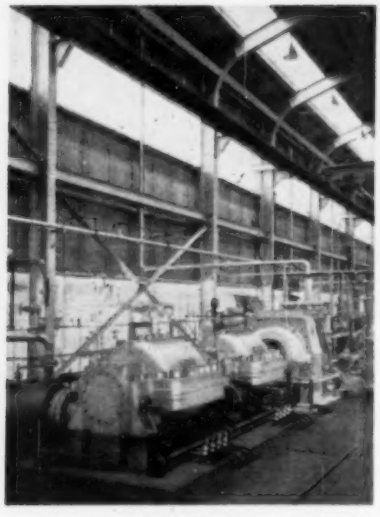
Advertisement in this issue, index is on page A-6.

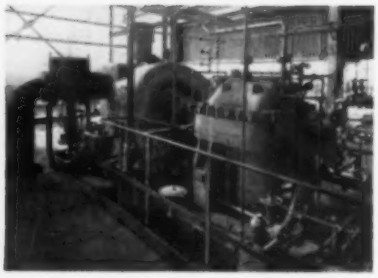
Six I-R turbo-compressors help increase capacity of

New ethylene plant of the Gulf Oil Corporation, Port Arthur, Texas. Stone & Webster Engineering Corporation, designers and constructors.



Steam-turbine driven I-R tandem centrifugal compressors in ethylene refrigeration service. Rated 3270 inlet cfm at 270 psia discharge pressure.

I-R gas compressor for handling feedstock. Rated 6230 inlet cfm at 252.7 psia discharge pressure. Driven by 4300 hp steam turbine.



I-R gas compressor, rated 11,400 inlet cfm at 264.7 psia discharge pressure. In propane refrigeration service. Steam-turbine driven.

AIR AND GAS COMPRESSORS for the process industries

Ingersoll-Rand builds a complete line of reciprocating and centrifugal compressors. Pressures range up to 35,000 psi and capacities up to 255,000 cfm. These machines are now serving in such important processing as synthesis of methanol, ammonia, rubber and toluol; hydrogenation and dehydrogenation; polymerization; and alkylation. Electric, steam, gas turbine, gas-engine, diesel and belt drive.

World's Largest Ethylene Plant

to over a million pounds a day!

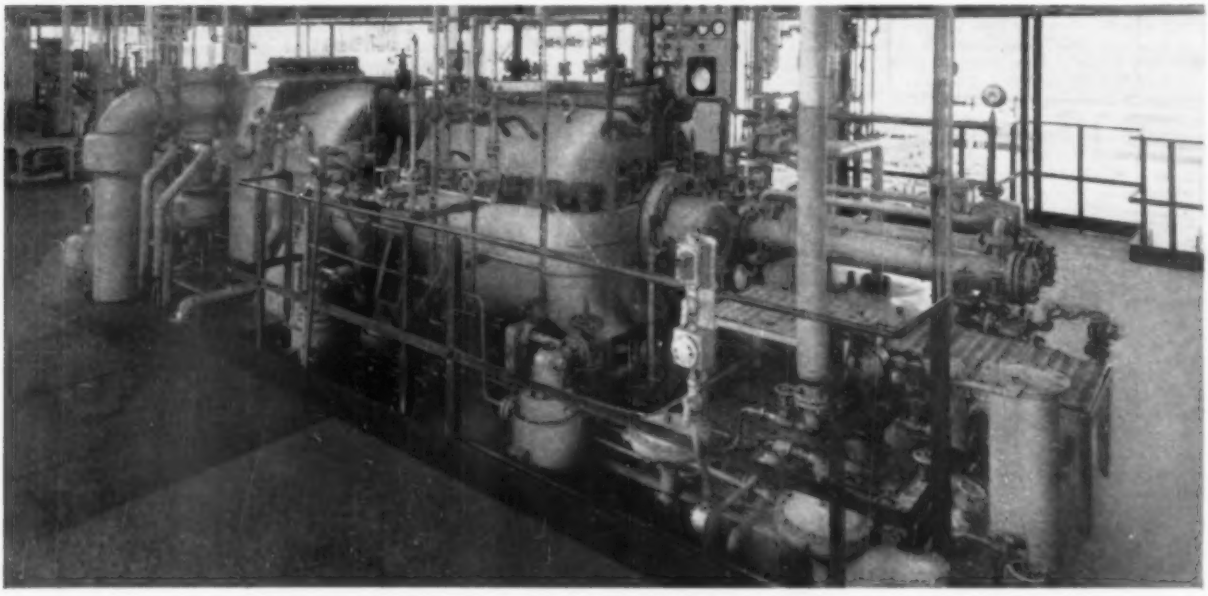
Serving Gulf Oil's Port Arthur No. 2 unit, these Ingersoll-Rand compressors are employed for compressing process gases and refrigerants

WHEN THE second ethylene unit of the Gulf Oil Corporation at Port Arthur, Texas, went on stream last year, it increased the plant's capacity by 220 million pounds a year. Now, the world's largest producer of commercial ethylene, it is supplying a growing number of customers in the Texas Gulf Coast area.

Of the six Ingersoll-Rand centrifugal compressors installed in the new No. 2 plant, three units are in process gas service. They are delivering a mixture of refinery gas and gas from the cracking furnaces to the recovery and separation section of the unit. The remaining three I-R compressors are handling ethylene and propane for cascade refrigeration in the separation section.

For exacting operations such as these, Ingersoll-Rand compressors have for years proven unusually successful. They meet the most rigid requirements of the process industries, in which millions of horsepower have now been installed.

Your I-R engineer will welcome the opportunity to help you solve your air or gas compression problems.



Close-up of I-R gas compressor. Steam-turbine driven, rated 19,100 inlet cfm at 76.2 psia discharge. For handling gases from cracking furnaces.

Ingersoll-Rand

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12-456

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Pgh 22 Pa, 3 Gateway Ctr, H G Phillipps — EX 1-1235
St Louis 8 Mo, 3615 Olive St, E J Seener — JE 1-3636

Solvent Service Incorporated
Painesville O, Box 228, W R Elliott — EL 2-2101

Southwestern Engineering Company
L A 58 Cal, 4800 Santa Fe Ave, Robt P Miller, Pres — LO 8-6262
A A Ficery, Sales Mgr Separator Div
Representatives in Principal Cities

Sparkler Manufacturing Company
Mundelein Ill, A C Kracklauer, Pres — 6-6430
F H Passalaqua, VP Sales
Representatives in Principal Cities

Spencer Turbine Company
Hartford 6 Conn, 486 New Park Ave — AD 3-6293
H H Richardson, Pres, R A Brackett, Sales Mgr
Chi 4 Ill, 53 W Jackson Blvd, C E Ludwig — HA 7-0102
L A 14 Cal, 656 S Los Angeles St, H M Grossman — VA 7-7760
Newark 2 N J, 24 Commerce St, R Graff — MA 2-3469
N Y 17 N Y, 101 Park Ave, R Webber — MU 3-5307

Square D Company, EC&M Division
Cleve 28 O, 4500 Lee Rd, A G Patterson, Pres — EN 1-1076
W R Yorkey, Sales Mgr
Ed Love, Sales Mgr Ind Controls Div
M P Kartalia, Sales Mgr Distribution Equip
Birmingham 19 Ala, 2920 S 18th St, J N Hutson — TR 1-2191
Cinn O, 2812 Burnet Ave, N Mark Hodapp — CA 1-1177
Cleve 28 O, 4500 Lee Rd, D H Dodt — LU 1-1800
Hammond Ind, 6337 Indpls Blvd, A J Freund — TI 4-1673
Houston 5 Tex, 2444 Times Blvd, O J Archer — JA 3-0434
L A 32 Cal, 4335 Valley Blvd, W M Conner — CA 1-0511
Royal Oak Mich, 12 Mile Rd, W J Sonnenburg — TR 2-0400
San Fran 24 Cal, 211 Industrial St, C A Mitchell — JU 7-6126

Standard Conveyor Company
Stillwater Minn, 315 N W Second St, H L Donahower, Pres — VI 7-1355
E E Boberg, VP Sales
Representatives in Principal Cities

Standard Oil Company (Indiana)
Chicago 80 Ill, 910 S Michigan Ave
Pike H Sullivan, Mgr Dev & Patent Dept

Standard Tube Company
Det 39 Mich, 24400 Plymouth Rd, S L Willis, Pres — KE 1-9300
L M Hogan, VP Sales
F W Sexauer, Special Sales
P J Selinger, Mgr Stainless Sales
Bklyn 27 N Y, 76-01 Woodhaven Blvd, F J Boehm — IL 9-3000
Representatives in Principal Cities

Stauffer Chemical Company
N Y 17 N Y, 380 Madison Ave, Hans Stauffer, Pres — OX 7-0600
S S Emison, VP Sales
Akron 8 O, 326 So Main St — PO 2-7423
Chi 1 Ill, Prudential Plaza — RA 6-8954
Houston 8 Tex, Box 7222 — TW -3333
L A 17 Cal, 824 Wilshire Blvd — TR -5771
Lubbock Tex — PO 2-8133
N Y 17 N Y, 380 Mad Ave — OX 7-0600
N Port Ore, Suttle Rd — AV 3-3675
Omaha Neb, 4111 S 11th St — OR-3200
San Fran 8 Cal, 636 Cal St — SU 1-5350
Tampa Fla, 2009 Orient Rd — 4-3127
Weslaco Tex — 733

Staytite Company
Houston 3 Tex, 3608 Polk Ave, H J Glauser Sr, Pres — FA 3-4354
N M Christensen, Sales Mgr

Stearns-Roger Manufacturing Company
Denver 4 Colo, Charles O Voigt, Pres — AC 2-8484
M G Brennan, VP Power Plant
Harvey Mathews, VP Mining-Chemicals-Metallurgical
Louis Weiss, VP Gas-Oil Industries
El Paso Tex, 215 N Stanton St, J G Clarkson — 2-4561
Houston Tex, 1115 City Nat'l Bk Bldg, George E Ohler — CA 4-6501
Salt L City U, 40 Richards St, D M Mills — 5-9071

Steel and Alloy Tank Company
Newark 5 N J, Ft of Bessemer St, Frank Zotti, Pres — BI 2-5000
C Willis Edgerton, Sales Mgr

Steel Forgings Incorporated
Shreveport La, 50 Fannin St, T D Sedberry, Pres — 2-3295
Bert Griffin, Sales Eng

Stephens Adamson Mfg Co, Sealmaster Bearings Div
Aurora Ill, 57 Ridgeway Ave, D L Stephens, Pres — 2-4311
C B Hurd, VP Sales Mgr
Representatives in Principal Cities

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L A 22 Cal, 5401 Telegraph Rd, Earl Mendenhall, Pres — RA 3-6211
John R Howell, VP Sales
Chi 35 Ill, 1927 N Harlem Ave, Earl J Phillips — TU 9-2200
Cinn 12 (Norwood) Ohio, 4610 Smith Rd, Joseph H Fallon — RE 1-5432
L A 22 Cal, 5401 Telegraph Rd, O M MacNaMa — RA 3-6211
N Y 17 N Y, 6 E 45th St, Harold D Hartman — OX 7-1050
Representatives in Principal Cities

Sterling Packing and Gasket Company Incorporated
Houston Tex, 1701 Nance St, C L Fenity Jr, Pres — CA 8-4404
Beaumont Tex, Box 3266, Joe Klipper
Corpus Christi Tex, 1652 Brownlee, Preston Coffey — TU 3-0582
New Orleans La, 20 Wren St, H E Thomas
Odessa Tex, 112 N Wash, Harry Denton — FE 7-7841
Okla City Okla, 1707 Westminister Pl, P R Nordstrom

Stitt Ignition Company
Columbus 1 O, 86 E First Ave, A R Brenholts, Pres — AX 9-5938
Houston 25 Tex, 4117 Sarong Dr, W J Bradley — MO 5-7429
L A 14 Cal, 704 S Spring St, T L Renfro — VA -0838
Tulsa Okla, 211 Tuloma Bldg, A J Knight — CH 2-4082
Representatives in Principal Cities

F J Stokes Corporation
Phila 20 Pa, 5500 Tabor Rd, F Doughterty Jr, Pres — CU 9-0100
A A Hutchings, VP Sales
Chicago 45 Ill, 3058 W Peterson Ave, William Henneman — RO 4-8040
Cleve 14 O, 1517 N B C Bldg, Malcolm S Adler — SU 1-7120
Mt Vernon N Y, 26 E First St, John C Coleman — MO 7-1705
Pasadena 1 Cal, 15 N Euclid Ave, Loren A Patrick — RY 1-8619
Portland Conn, 252 Main St, Harold G Roman — DI 6-2601
Union N J, 2165 Morris Ave, Ralph Stalbaum — MU 8-2345

Stone & Webster Engineering Corporation
N Y 4 N Y, 90 Broad St — BO 9-4224
Boston 7 Mass, 49 Federal St — HA 6-2500
Chi 3 Ill, 33 S Clark St — RA 6-2700
Houston 2 Tex, 850 Esperson Bldg — CA 4-9124
L A 17 Cal, 609 S Grand Ave — MA 6-0221
San Fran 4 Cal, 235 Montgomery St — SU 1-4504
Seattle 1 Wash, 707 Lloyd Bldg — EL -2780

Stratford Engineering Corporation
Kansas City 12 Mo, 612 W 47th St, D H Putney, Pres — LO 1-5030
C W Edmundson, Chief Engineer
Houston Tex, 1223 Waugh Dr, W B Rawson — JA 3-1696
L A 57 Cal, 2500 W 6th St, Lester Oberholtz — DU 8-1339
Pgh 19 Pa, 501 Alcoa Bldg, D D Foster — AT 1-0865

Strong Carlisle & Hammond Division
Cleve 13 O, 1392 W Third St, H H Maltbie, Sales Mgr — TO 1-8800
Houston Tex, 1434 W Alabama, J W Jones
Lansdowne Pa, 98 Walsh Rd, W O Clark — MA 6-7634
Reading Mass, 22 Catherine Ave, O F Sutliff — RE 2-3087

Struthers Wells Corporation
Warren Pa, 1003 Penna Ave W, H W Conarro, Pres — 680
R J Reed, Process Equip Sales Mgr
Boston 10 Mass, 201 Devonshire St, T F Fitzgerald — HA 6-0790
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- Potassium Fluoride
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Chi 2 Ill, 6 N Mich Ave, A B Rowley — FI 6-4655
N Y 20 N Y, 30 Rockefeller Pl, J W Pike — PL 7-7272
Phila Bala-Cynwyd Pa, 29 Bala Ave, H G Uphouse Jr — MO 4-8147
So Orange N J, 764 Scotland Rd, P F McEvoy — SO 2-8792

✓Sun Shipbuilding and Dry Dock Company
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Perry E Shaver, Sales Mgr

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Bristol Conn, 83 Laurel St, A B Nelson, Pres — LU 2-9561
J S Louden, Sales Mgr
Balt 15 Md, 4033 W Rogers Ave, R H Link — MO 4-8902
Dallas 6 Tex, 4515 Prentice St, I F Walk — EM 1-2174
Medina O, 101 Public Sq, H W Lorenson — 3-3761
Miami 37 Fla, 2217 Biscayne Blvd, J C FitzGerald — FR 4-4103
N Y 17 N Y, 250 Park Ave, B G Deming — YU 6-7930
Oak Park Ill, 721 S Blvd, R J Caccavelli — EU 3-5430
Redwood City Cal, 2881 El Camino Real, M D Stokem — EM 8-7094
Seattle 4 Wash, 810 Third Ave, R L Wiggs — MU -1323
Van Nuys Cal, 14663 Titus St, E S Williams — ST 6-3626

Swartwout Company
Cleve 12 O, 18511 Euclid Ave, D K Swartwout, Pres — IV 1-0780
M M Ward, Sales Mgr
Alhambra Cal, 317 W Main St — AT 1-3638
Chi 13 Ill, 1005 W Belmont Ave — GR 7-0675
Decatur Ga, 235 Ponce de Leon Ave — DR 7-1253
Houston Tex, M & M Bldg Rm 835 — CH -6973
Jenkintown Pa, 122 York Rd — TU 4-3255
N Y 17 N Y, 103 Park Ave — MU 3-5860

T

Taylor Instrument Companies
Rochester 1 N Y, 95 Ames St, Raymond E Olson, Pres — GE 8-4800
L Laurence Foward, Genl Sales Mgr
Atlanta 3 Ga, 301 Bona Allen Bldg, H M Barker — JA 2-9554
Balt 18 Md, 35 E 21st St, A E Clawson — BE 5-8110
Buff 17 N Y, 2882 Delaware Ave, Graham Hill — VI -5245
Cinn 9 O, 3047 Madison Rd, A T Manzler — EL 1-3636
Cleve 14 O, 1367 E Sixth St, H W Maurer Jr — CH 1-2578
Houston 11 Tex, 5001 Navigation Blvd, R E Bailey — WA 6-4486
L A 39 Cal, 2455 Riverside Dr, A J Fink — NO 2-3191
Mpls 16 Minn, 5009A Excelsior Blvd, H A Hunt — WA 6-1873
Needham 92 Mass, 945 Great Plains Ave, J E Hart — NE 3-4130
N Y 20 N Y, 45 Rockefeller Plaza, H A Irving — JU 6-3544
Oak Pk Ill, 423 So Blvd, R B Reynolds — EU 6-9253
Phila 3 Pa, 1617 Penna Blvd, J P Humphrey — RI 6-1156
Pgh 16 Pa, 2882 W Liberty Ave, F C Fuzzard — LE 1-3301
Roch 1 N Y, 95 Ames St, J K Hill — GE 8-4800
St Louis 8 Mo, 4655 Maryland Ave, R G Ellis — FO 1-3445
San Leandro (San Fran) Cal, 1661 Timothy Dr, G H Linsley — LO 9-1661
Schenectady 2 N Y, 147 Vley Rd, D J Morrissey — FR 2-8211
Silver Spring Md, 8485 Fenton St, E A Capelle — JU 9-1117
Tulsa 3 Okla, 613 E Fourth St, R E Flikkema — DI 3-7139
Wilm 1 Del, 10th & Shipley Sts, J E Anderson — OL 8-6408

Tears Engineers
Dallas 5 Tex, 4617 Cole Ave, C F Tears, Pres — LA 6-7474

Tellepsen Petro-Chem Constructors
Houston 1 Tex, Box 2536, Emory E Gose Jr, VP — WA 3-9331
Stafford H Wilde, Sales Mgr
Baton Rouge La, 1719 Florida St, Gordon C Whiteside — 4-0962

✓Tennessee Corporation
Atlanta Ga, 619 Grant Bldg, L S Kaniecki, Sales Mgr — JA 3-5024

Texaco Development Corporation
N Y 17 N Y, 135 E 42nd Street

Texas Instruments Incorporated
Houston Tex, 3609 Buffalo Speedway, Robt W Olson, Pres — JA 6-1411
John Weber, Sales Mgr
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Bedford Harrison Jr, Sales Eng

Texsteam Corporation
Houston 11 Tex, 320 Hughes St, J P Turner, Genl Mgr — WA 6-8853
F O Richards, Sales Mgr
Representatives in Principal Cities

Thiokol Chemical Corporation
Trenton 7 N J, 780 N Clinton Ave, J W Crosby, Pres — EX 6-8195
Dr S M Martin Jr, Sales Mgr

Thompson Tool Company
Iowa Pk Tex, Box 547, L L Thompson, Pres — 3521
F L White, Sales Mgr
Houma La, 1803 Furman, Joe F Bell — 2-0378
Houston Tex, 4011 Ruskin, W H Clark — MO 5-7558
Odessa Tex, 207 N Amburey, S LaGrone — FE 2-9611

Arthur Tickle Engineering Works Inc
Bklyn N Y, 21 Delevan St, Arthur B Tickle Jr, Pres — MA 5-4200
Nicholas P Harvey, Sales Mgr

Titeflex Incorporated
Springfield 4 Mass, Hendee St, E E Husted, Pres — RE 9-5631
E E Husted III, Genl Sales Mgr

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Toledo 4 O, 1445 Summit St, P C Cooke, Pres
C E Hartsing, Sales Mgr

Tracerlab Incorporated
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T L Kelley, Sales Mgr Instrument Div
G McKewen, Sales Mgr Industrial Div
Chi 5 Ill, 1114 S Mich Ave, Frank Benedict — HA 7-4043
Cleve 3 O, 4614 Prospect Ave, William McCarthy — EX 1-1012
Houston Tex, 2419 S Blvd, E Blankenmeister — JA -9401
N Y 16 N Y, 660 First Ave, Herb Taylor — MU 5-0900
Phila 3 Pa, 124 N 18th St — RI 6-5190
Richmond 3 Cal (San Fran), 2030 Wright Ave, John Morris — BE 5-2633
Sherman Oaks Cal (L A) 4841 C Fulton Ave, John Morris — ST 9-0192

Tranter Manufacturing Incorporated
Lansing Mich, 735 E Hazel St, James R Tranter, Pres — IV 4-4531
Sheldon J Stowell, Sales Mgr

✓Tretolite Company, Division of Petrolite Corporation
St Louis 19 Mo, 369 Marshall Ave, C M Blair, Pres — WO 1-3500
J E Stockton Jr, Domestic Sales Mgr
Dallas Tex, 2301 Mercantile Bk Bldg, M J Mullally — RI 7-0764
San Antonio Tex, 1903 Milam Bldg, C C Rogers
Tulsa Okla, 2100 S Union, Harry S Horton
L A 22 Cal, 5515 Telegraph Rd, C S Morris — RA 3-6541

True Gum-All Equipment Corporation
Tulsa Okla, 6921 E 11th St, Max M True, Pres — TE 8-3903
Conley Kelsey, Sales Mgr

Max True Company
Tulsa Okla, Box 2526, Max M True, Pres — GI 7-3540

Tube Turns, Division of National Cylinder Gas Company
Louisville 1 Ky, 224 E Brdwy, John G Seiler, Pres — JU 7-7551
J E Chumbley Jr, Asst Genl Sales Mgr
Atlanta 3 Ga, 22 Marietta St, J F Craig Jr — JA 2-7310
Chi 5 Ill, 600 S Mich, J C Ellsworth — HA 7-8526
Dallas Tex, Meadows Bldg, W R Emrich — EM 8-7095
Denver Colo, 1160 10th St, V L Shallcross — TA 5-3045
Houston 1 Tex, 7120 Katy Rd, W B Whenthoff — UN 9-3531
K C Kans, 5019 W 55th, (Mission Kans) R A Hennier — WE -8111
L A 58 Cal, 2417 E 24th St, N P Bosemer — LU 7-8287
Midland Tex, 209 Ridglea Dr, M DeCamp — MU 2-5743
N O La, 1205 St Charles, E C Headley Jr — TU -5611
N Y 38 N Y, 150 Broadway, W P Curley — RE 2-8230
Phila 3 Pa, Suburban Station, W E Geiser — RI 6-0827
Pgh 19 Pa, 1718 Grant Bldg, H P Smith — AT 1-8848
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Tulsa 3 Okla, 305 Wright Bldg, L O Morris Jr — CH 2-9193

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Union Carbide and Carbon Corporation
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Atlanta 3 Ga, 41 Marietta St N W, C & C Chemicals Co — JA 4-5081
Balt 18 Md, 532 E 25th St — CH 3-0200
Balt 1 Md, 210 N Charles St, C & C Chemicals Co — SA 7-7365
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Buffalo 2 N Y, 1812 Liberty Bk Bldg, C & C Chemicals Co. — WA -5916
Charleston 1 W Va, 2 Virginia St — 3-5658
Chi 1 Ill, 230 N Mich Ave — FI 6-3300
Cinn 29 O, 709 Melish Ave — CA 1-1600
Cinn 6 O, 2330 Victory Pkwy, Bakelite Company — UN 1-3035
Cinn 6 O, 2506 May St, C & C Chemicals Co — AV 1-4450
Cleve 14 O, 1300 Lakeside Ave — MA 1-4202
Dallas 1 Tex, 2626 Commerce St — RI 7-8618
Dallas Tex, 1511 Bryan St, C & C Chemicals Co — RI 1-9176
Denver 9 Colo, 685 S Brdwy — RA 2-4621
Denver 9 Colo, 695 S Brdwy, C & C Chemicals Co — PE 3-2476
Detroit 21 Mich, 10421 W Seven Mile Rd — DI 1-3131
Houston 11 Tex, 6119 Harrisburg Blvd — WA 6-3165
Houston 25 Tex, 1100 E Holcombe Blvd, C & C Chemicals Co — JA 3-4401
Indpls 4 Ind, 729 N Penna St — ME 5-3577
Indpls 4 Ind, 5 E Market St, C & C Chemicals Co — ME 2-5548
K C 5 Mo, 910 Balt Ave — BA 1-2400
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N Y 17 N Y, 30 E 42nd St, Bakelite Company & Haynes ... MU 7-8000
N Y 17 N Y, 100 E 42nd St, C & C Chemicals Co & Silicones ... MU 6-5100
N Y 17 N Y, 205 E 42nd St, Linde Air Products Co ... MU 7-8000
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Phila 3 Pa, 117 S 17th St, Bakelite Company ... RI 6-4779
Phila 7 Pa, 12 S 12th St, C & C Chemicals Co ... MA 7-5955
Pgh 22 Pa, 644 Oliver Bldg, Mellon Sq ... EX 1-3800
Phoenix Ariz, 401 E Buchanan St ... AL 4-9487
Port 9 Ore, 1205 NW Marshall St ... CA 7-2603
St Louis 8 Mo, 4228 Forest Pk Blvd ... FR 1-2580
St Louis 22 Mo, 122 N Kirkwood Rd, Bakelite Company ... YO 5-2440
St Louis 5 Mo, 10 S Brentwood Blvd, C & C Chemicals Co ... PA 6-0324
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Spokane 12 Wash, 203 W Maxwell Ave ... FA -4503
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E A Ware, Sales Mgr Central Div
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Charlotte N C, 5028 Furman Pl, J F Osteen ... FR 7-4575
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Cinn 37 O, Reading & Section Rds, T G DeDiemar ... RE 1-9564
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Det 4 Mich, 7655 Grand River Ave, C H Alexander ... TY 7-0550
Ft Worth Tex, 4854 Cole St, N W Stayton ... ED 2-1065
Fresno 1 Cal, 155 Van Ness, W A Joubert ... AM 6-0689
Hastings Neb, 120 S Hastings St, M T Thompson ... HA 2-5304
Houston 2 Tex, 2314 S Main St, J J Ambrose ... JA 8-5477
Indianapolis 5 Ind, 709 E 38th, T Fauntleroy ... WA 3-2407
Kal Mich, 208 Elm St, D C Dibble ... FI 5-6998
K C Mo, 228 W 4th St, I P Abel ... VI 2-0225

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Sellersville Pa, P Johnston, Sales Mgr ... 7-6825
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Buffalo 25 N Y, 54 Gruner Rd, J Hursh ... KE -8080
Chi 5 Ill, 916 S Mich Ave, C Spens ... HA 7-0977
Cleve 15 O, 1010 Euclid Bldg, R V James ... TO 1-0612
Houston 3 Tex, 1607 Jefferson Ave, L Whitson ... CA 4-1236
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Chi 5 Ill, 624 S Mich Ave, G H Stanton ... WA 2-1650
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Cleve 13 O, Rockefeller Bldg, W F Hinz ... CH 1-0073
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K C 6 Mo, 903 McGee St, R A Parker ... VI 2-2413
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H E Humphreys Jr, Pres
E T Day, Genl Sales Mgr
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Boston 6 Mass, Box 2116, O S True ... DE 3-6000
Buff 3 N Y, 133 E Swan St, L L Jewel ... WA -0827
Chi 32 Ill, 4135 S Pulaski Rd, J F Comstock ... CL 4-5700
Cinn 37 O, 4921 Para Dr, R W Stamlawich ... EL 1-3200
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Houston 20 Tex, 5711 Armour Dr, J W Batten ... WA 3-2581
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L A 58 Cal, Soto & E 46th Sts, D L Reid ... LU 9-3161
Milw 5 Wis, 1314 N 7th St, H E Giddings ... BR 6-7634
Mpls 1 Minn, 400 2nd Ave N, W E Larson ... FE 2-8251
N O 25 La, 900 S Jeff Davis Pkwy, D C Lee ... GA -2131
N Y 13 N Y, 191 Hudson St, R H Bowman ... CA 6-7100
Omaha 2 Neb, 707 W O W Bldg ... WE -9220
Phila 6 Pa, 5th & Locust Sts, H B Allison ... LO 3-7445
Pgh 12 Pa, 101 Sandusky St, H B Davis Jr ... FA 1-3200
Port 9 Ore, 630 N W 10th Ave, L F Koepp ... CA 7-6571
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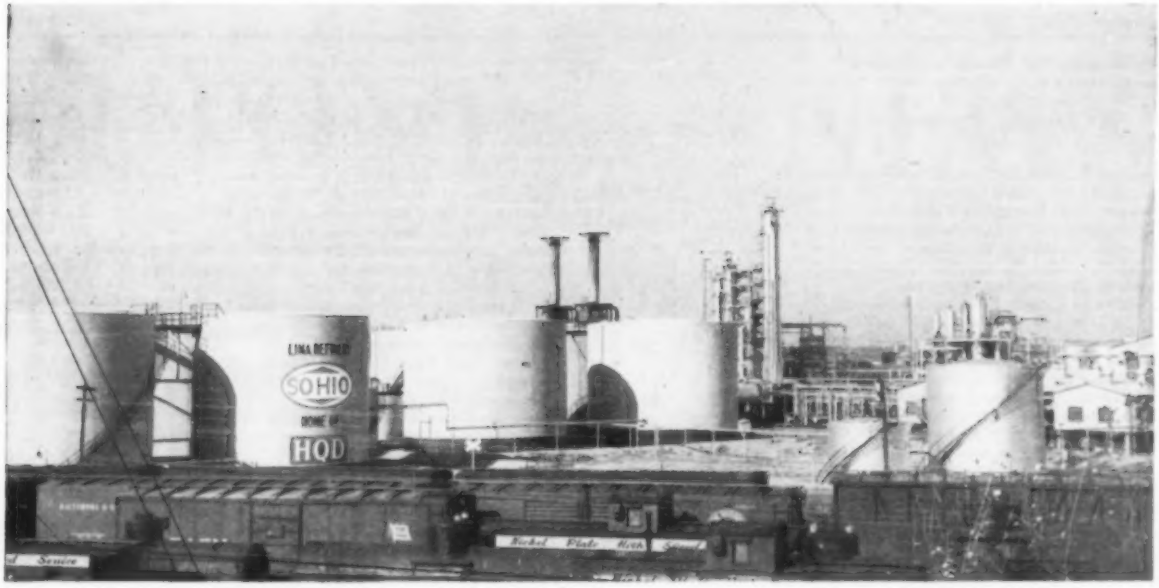
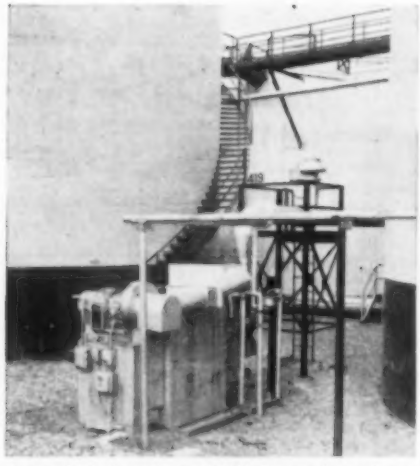


SOHIO safeguards fine lube oils with a blanket of DRY air



Several of these Type CHK Lectrodryers® are spotted among the tanks they serve.

FINE LUBRICATING OILS, like those produced here at the Sohio Lima Refinery, must be guarded against contamination by moisture. Sohio accomplishes this by maintaining a blanket of DRY air over the oil at all times, and by admitting DRY air to a tank as oil is drawn off.

Lectrodryers do this DRYing with very little attention. A valve is thrown manually or automatically, at regular periods, to put a column on DRYing and then on regeneration, a cycle that's repeated day after day, year after year.

Other Lectrodryers here at Lima are DRYing propane before it goes into storage, while still others DRY instrument air, helping assure dependability of this huge refinery's operations.

Whatever your problems with unwanted moisture, there's a Lectrodryer to solve it. For DRYing help, write Pittsburgh Lectrodryer Division, McGraw-Edison Company, 307 32nd Street, Pittsburgh 30, Pennsylvania.

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DU PONT *Petroleum Chemicals* NEWS

One of a Series of Bulletins for the Petroleum Industry

MARCH 1957

Locomotive maintenance men report longer bearing life with fewer greasings

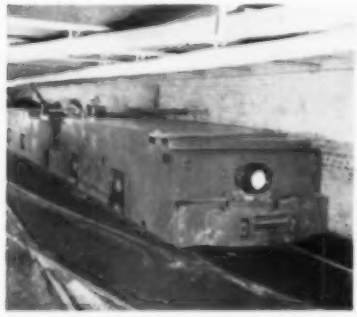
After switching to a grease based on Du Pont Estersil GT (grease thickener), one company substantially reduced bearing maintenance and replacement costs.

Running almost continuously, the company's 22 locomotives many times a day haul heavy cars from mine to surface. They operate in tandem to pull 210-ton loads seven miles up a 3% grade.

Bearing maintenance reduced

Under such rugged service, the temperature of the four armature bearings in each locomotive rises as high as 300°F. Before an estersil-based grease was used, the bearings were greased every month. Now with estersil grease, the job is done only every *two* months.

The company's mechanics report important savings on bearing replacement as well. They point to the company's previous average of one bearing replacement every two weeks. Since estersil-based grease has been used (six months), not a single bearing replacement has been necessary.

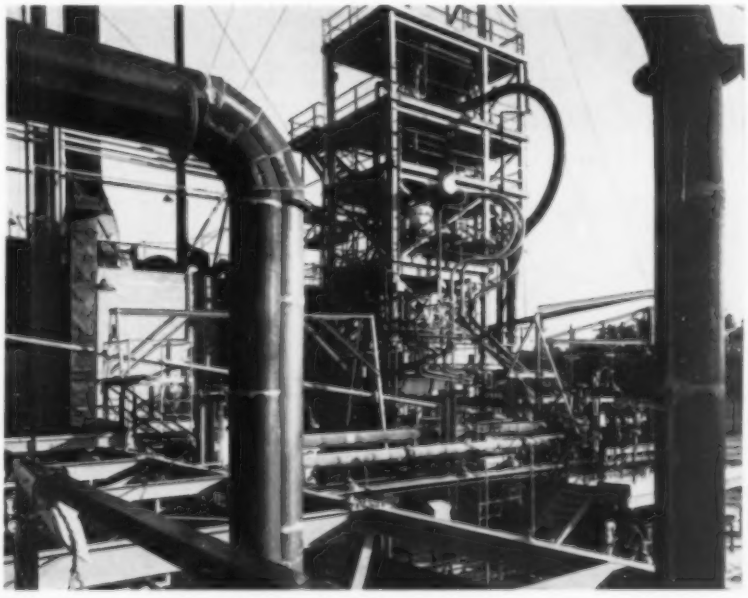


This compact locomotive operates under the toughest conditions. The grease packed into its armature bearings must have special properties to withstand the dust, high shear, and hot bearing temperatures.

The unique qualities of Du Pont Estersil GT are behind such dependable service. Estersil greases show outstanding resistance to mechanical breakdown and are practically immune to water, extreme heat and extreme cold.

New Du Pont West Coast TEL plant now in production

The new tetraethyl lead plant constructed by Du Pont at Antioch, California, is now on stream. This will make possible extra-fast deliveries of California-made TEL to all West Coast refiners.



Top of TEL pipe alley looking toward reactor tower.

The new plant is located approximately two miles east of Antioch on the San Joaquin River.

Integrated facilities

The new plant was built to meet the needs of the fast-growing West Coast oil industry. The present Du Pont Petroleum Chemicals Division regional laboratory at El Monte, and sales offices in Los Angeles, San Francisco and Seattle, together with the new plant, will provide complete service for TEL-users on the West Coast.

Plant most modern in the world

The new Du Pont plant has the most modern TEL manufacturing facilities in the world, incorporating in its design and equipment the latest continuous processing advances and many other production refinements.

A Du Pont Petroleum Chemicals Division representative will be glad to give you more detailed information about estersil GT and to provide samples. Contact any of our sales offices.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DU PONT *Petroleum Chemicals* NEWS

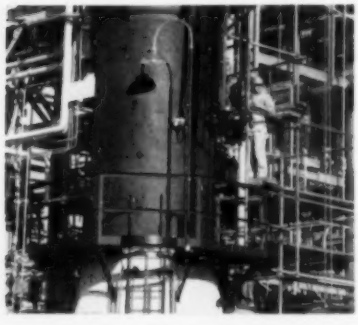
CONTINUED

New TEL Plant

Another new Du Pont plant for making "Freon"* refrigerants and propellants is also located at Antioch. The "Freon" facilities were completed and production was started last fall.

Du Pont becomes a larger West Coast customer

The two Du Pont plants at Antioch have become important new customers for large volumes of materials produced locally. Du Pont employees at Antioch already number 325; they were recruited locally.



Base of ethyl chloride column, TEL area.

Operator logging data in TEL area.

TEL central control room.

THESE MEN HEAD NEW ANTIOCH TEL PLANT

HENRY L. GREENE

DONALD C. MILLER

Top management posts at our new Antioch plant have been filled by Henry L. Greene and Donald C. Miller. Mr. Greene is plant manager and Mr. Miller assistant plant manager of the combined new TEL and "Freon"* refrigerant and propellant plants.

Mr. Greene joined the Du Pont Company in 1934 as a senior engineer. He advanced to supervisory posts at the Chambers Works, in New Jersey, then moved to Du Pont's neoprene plant at Louisville, where in 1946 he became assistant manager. In 1952 he was appointed assistant manager of the Savannah River Plant. He is a chemical engineer, a graduate of Kansas State College.

Mr. Miller came with Du Pont in 1937 as an analyst at Jackson Laboratory, Chambers Works. Following assignments in several other plants, he returned to the Chambers Works in 1943, where he became senior supervisor in TEL production. When in 1951 he was awarded the position of assistant works engineer, he was one of the youngest men ever to fill the job.

Mr. Miller received his B.S. in chemical engineering from Ohio State University.

**Registered Du Pont trademark.*

LITERATURE AVAILABLE

Here is a partial listing of the many bulletins, reports, booklets, technical papers, and other aids available to you through any of the Du Pont Petroleum Chemicals Division offices:

Du Pont Estersil GT—A brief description of the properties, composition and applications of estersil grease thickener. Explains estersil grease preparation and contains handling information.

New Du Pont Dry-dye Eduction Probe and No-dust Drumhead—A folder describing and illustrating the revolutionary new dry-dye eduction devices, which make gasoline dyeing a cleaner, faster, and more efficient operation.

Sales Promotional Aids for Dealer Meetings—Describes the many Du Pont aids available for dealer meetings. A handy check list for anyone planning dealer meeting programs.

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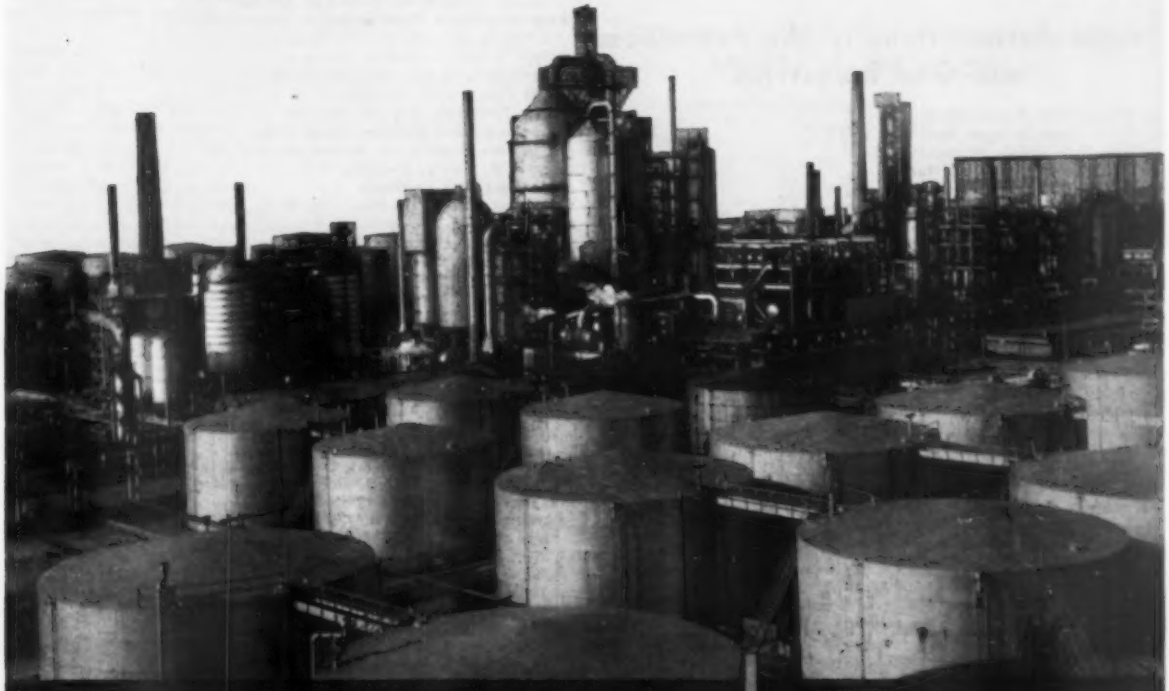

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A guide to the trade and professional associations of the most interest to engineers, chemists, and other purchasing factors in refining, gas processing, and petrochemicals. Source: U. S. Department of Commerce publication "National Associations of the United States," 1956 edition.

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PERSONALS

L. L. Patterson of Blackwell, Oklahoma, has been appointed production superintendent of Cities Service Oil Company's Ambrose gasoline plant near Blackwell.

A. S. (Steve) Gilliam has been appointed plant manager of Great Northern Oil Company's Pine Bend refinery, Pine Bend, Minnesota. He has most recently been project manager and assistant plant manager of the Olin-Mathieson Chemical Corporation.

Robert M. Kennedy has been appointed associate director of Sun Oil Company's research and development department. **Abraham Schneider** has been named manager of the basic research division, succeeding Dr. Kennedy. Dr. Schneider was formerly section chief in the fuels division.

C. W. Lyon, design engineering supervisor at the Ohio Oil Company's Robinson, Illinois, refinery, has been appointed supervisor in the Findlay, Ohio, general offices. **T. B. Steele, Jr.,** formerly assistant design engineering supervisor, succeeds Lyon.

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Dr. Ellis K. Fields has been appointed a group leader in the Standard Oil Company (Indiana) research department at Whiting, Indiana. He is in the organic research division and will work with others in exploratory research in the field of high octane hydrocarbons and petrochemicals.

Three high-level staff changes at Shell Chemical Corporation's Houston plant have been announced. **J. W. Hyde,** assistant superintendent-operations, has been promoted to plant superintendent, replacing **H. E. Hughes.** Hughes, in turn, has been transferred to Shell Chemical's Denver, Colorado, plant, where he will assume the position of plant manager. **D. N. Rindsberg** will move to assistant superintendent-operations from his present duties as assistant superintendent-technical.

Berndt K. Lyckberg, W. R. Grace & Company's Polymer chemicals division, has been named general manager of the new high density polyethylene plant in Baton Rouge, Louisiana. Previously he served as manager of the chemical laboratories of Firestone Plastics Company, Pottstown, Pennsylvania.

R. A. Appleman has been appointed general traffic manager of Esso Standard Oil Company. He was named assistant general traffic manager last year, and more recently has been acting head of the company's traffic department.

R. A. Appleman

L. C. Byck, Jr.

Lawrence C. Byck, Jr. has been named manager of heavy chemical sales for U. S. Industrial Chemicals Company, division of National Distillers Products Corporation. He formerly was assistant to the manager of chemical sales.

William J. Abnett has been appointed an assistant project engineer in Sun Oil Company's manufacturing department. Previously he served as assistant technical adviser on natural gas and natural gasoline projects in Sun's production department.

N. C. Kymes has been named superintendent of the Fittstown, Oklahoma, natural gasoline plant (No. 7) of Kerr-McGee Oil Industries, Inc. He succeeds **Fred Fox,** who resigned to accept a position at Kendrick, Oklahoma. **Kenneth Smith** has been named to fill Kymes' former position as field superintendent of the Milfay, Oklahoma, plant (No. 9).

Harry Hamilton, formerly gas tester, has been named staff assistant to the manager of the national gasoline department as chief gas tester and scout. **Othell Flatt,** former office manager at the Pampa, Texas, plant (No. 6), has assumed the duties of gas tester, and will be stationed at Milfay. **Gene Gessner,** formerly with the Sohio Oil Company, has been appointed engineering staff assistant to the manager of the national gasoline department.

GREETINGS

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Tuloma Buildings, Inc.
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Union Steam Pump Sales Company
United Centrifugal Pumps
United Chemical Corp.
Universal Oil Products Company

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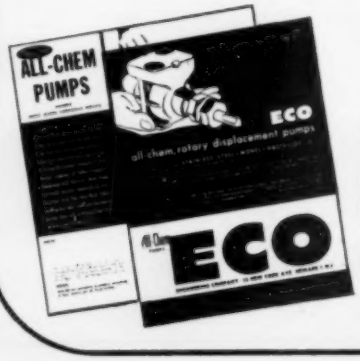

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Personals

Merritt C. Hewitt has been named assistant manager of asphalt sales for American Oil Company. He formerly served as director of research and development at the company's asphalt research laboratory in Baltimore, Maryland. **James V. Evans** will succeed Hewitt at Baltimore. He was formerly assistant to the director of the asphalt research laboratory at Baltimore.

M. C. Hewitt

J. V. Evans

J. L. Miller, superintendent-operations of Shell Oil Company's Houston refinery, has been named manager of the Montreal refinery of Shell Oil Company of Canada, Ltd. With Shell for 36 years Miller started with the company as a gager at Wood River, Illinois, in 1920. He is a veteran of both World Wars, serving one year in France during World War I with the Army Air Corps, and four years in the South Pacific during World War II.

J. L. Miller

A. J. Ferguson

The appointment of **A. J. Ferguson** as manager of the crude oil purchasing department, Esso Standard Oil Company, has been announced. Ferguson, formerly assistant manager of the department, succeeds **C. H. Whitman,** who is retiring after almost 42 years of service with the company.

Glenn O. Hayes has been appointed to the newly created position of director of employee relations of Ethyl Corporation.

Formerly resident manager of the company's Houston, Texas, manufacturing plant, he will make his headquarters in New York City.

Curtis R. Holton, formerly director of industrial relations, has resigned to open his own consulting firm.

R. B. Stewart has been promoted to manager of Phillips Petroleum Company's natural gas department. He succeeds A. M. Rippel, who died December 12 in the crash of a company plane near Bartlesville, Oklahoma. **Dan L. Mayer,** formerly general superintendent of the department, has been advanced to replace Stewart as assistant manager.

Also announced was appointment of **M. H. Cullender,** previously gas sales representative at Amarillo, Texas, as director of the department's engineering division. **W. L. Cox** succeeds Cullender as Amarillo representative.

NEW Refining Equipment

Tool Combines Impact with Torque Control. Ingersoll-Rand announces a development which makes it possible to run nuts with the great speed of an Impactool to a controlled torque. The company has developed an air-operated Torque Control Impactool which will run a nut to any desired torque, then automatically shut itself off.

Tool incorporates the torsion bar principal to torque control. The action of the mechanism can be likened to that of a pogo stick, which bounces evenly on soft ground, but suddenly rebounds higher when it strikes a hard surface. While the nut is being run to required torque, the Impactool operates at normal power and speed, but when required torque is reached and nut-running resistance is equal to the stress preset in the torsion bar, the impact mechanism rebounds instantly and trips a rubberfaced shutoff valve. *Ingersoll-Rand Company.*

Circle number (41) on reply card.

All-Stainless Steel Temperature Regulator. Designed to withstand the corrosive effects of certain fumes, gases, acids, and chemicals, a new stainless steel temperature regulator is now offered by Fulton Sylphon Division of Robertshaw-Fulton Controls. Regulator, called the No. 11061-R, was developed mainly for use in chemical plants. Similar in operation to other Fulton Sylphon regulators, unit requires no external power source, such as compressed air, water, or electricity to function. *Fulton Sylphon Division, Robertshaw-Fulton Controls Company.*

Circle number (42) on reply card.

Taper-Face Flange Protects Valves. Tube-Turn 125-lb, taper-face, lightweight welding neck flange offers important technical and cost advantages where light-schedule pipe must be connected to 125-lb cast iron valves and other equipment.

Flange overcomes two difficulties. First, its tapered face causes greater pressure to be exerted near the bore. Second, strain gage tests show that the new flange, equipped with a full-face gasket, can be safely bolted to cast iron or semi-steel flanges. Also, hydrostatic tests indicate that when properly employed the joint is capable of withstanding approximately three times the pressure it could contain if the taper was omitted.

New flange is rated at 125 psi for water, oil, and gas service. *Tube Turns, division of National Cylinder Gas Company.*

Circle number (43) on reply card.

Liquid Degreasing and Emulsifying Compound. "MM-17" safely cleans oil storage tanks, particularly the sludge accumulation from heavy oils. It also effectively emulsifies oil spills on water and other equipment in oil fields, refineries, bulk terminals and on tankers. *The Daniel Company.*

Circle number (44) on reply card.

Dividing Hydraulic Flow. Flow Divider developed by New Products Corporation has some very unusual features. It can be adjusted with an ordinary screw driver to control the flow over a wide range from 10 percent to 95 percent as the circuit may require. It has a built-in relief valve that will pass the oil back to the sump when the peak pressure setting of the secondary flow is reached. *New Products Company.*

Circle number (45) on reply card.

Totally Enclosed Pump Motors. Line of totally-enclosed, fan-cooled, explosion-proof pump motors are completely corrosion-proof, from core to cover. Available with C-face and D-flange mounting on the fan cover, the new motors accept direct mounting of close-coupled centrifugal and hydraulic pumps on one or both ends of the motor. The end bracket and fan cover on the new motors are integrally cast to produce 1-piece strength and rigidity, and to insure concentricity between stator fit, bearing housing, and mounting. *Reliance Electric and Engineering Company.*

Circle number (46) on reply card.

Paper-thin Layer of Plastic. Plastic layer promises to do away with the problem of leaks at joints in cemented, or solvent-welded, plastic pipe installations. The plastic layer makes the inner half of the fitting slightly smaller than the outside diameter of the pipe it is used to join. But a light coat of solvent base cement on the inside of the fitting, and on the pipe end, softens the plastic layer so the pipe can be pushed snugly into place. High contact pressure between pipe and fitting causes a positive weld. New fittings, called Uscoweld, are made of styrene-acrylonitrile. *United States Rubber Company.*

Circle number (47) on reply card.

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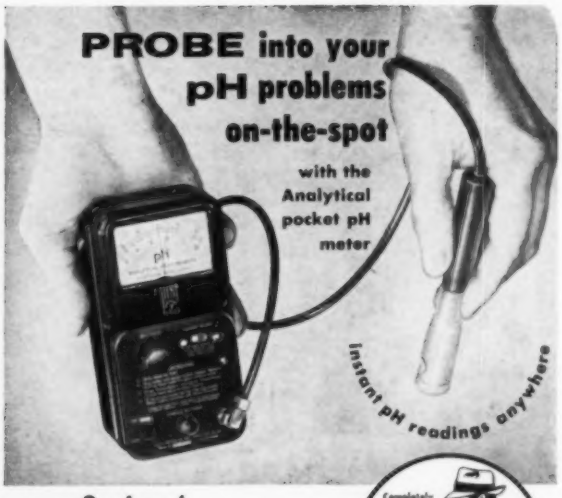

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New Equipment

Cutting Non-Ferrous Metal Plate. Inert gas welding process is now being used for cutting non-ferrous metals in addition to welding ferrous and non-ferrous metals.

Using standard equipment, this new process requires no special operator techniques. Simple adjustments in gas flow and steel wire speed are all that are needed. Both high-production machine equipment and manual equipment can be adjusted for cutting with equal facility. Aluminum, stainless steel, chrome steel, nickel, Monel, Inconel, copper, brass, and aluminum bronze have been cut satisfactorily for subsequent welding operations. *Air Reduction Sales Company.*

Circle number (48) on reply card.

Direct Mounting Totally-enclosed Motor. Facilities for mounting the driven equipment directly to the motor has been developed by U. S. Electrical Motors, Inc. Accurate alignment is provided by a totally-enclosed, NEMA style "C" bracket with tapped holes for bolting from the driven equipment side. Designed to the new dimension standard of NEMA, the motor has more horsepower in less space. Designated Type J, the motor is available in ratings of 1 to 30 hp. *U. S. Electrical Motors, Inc.*

Circle number (49) on reply card.

Inexpensive Spectrophotometer. Beckman has developed a low cost automatic recording instrument expressly designed for the analytical and organic chemist. New instrument, Beckman IR-6, records linearly in transmittance and wave-length from 2 to 16 microns, and offers excellent accuracy and resolution for qualitative and quantitative analysis. *Scientific Instruments Division, Beckman Instruments, Inc.*

Circle number (50) on reply card.

Packless Steam Solenoid Valve. A valve, Bulletin 8222A, introduced by Automatic Switch Company, may be used in a variety of applications for the automatic control of the flow of steam, hot fluids or gases (up to 400 F). Internal pilot operated solenoid valve has a rugged forged brass body and bonnet. Teflon discs are provided assuring tight shut-off without maintenance problems. *Automatic Switch Company.*

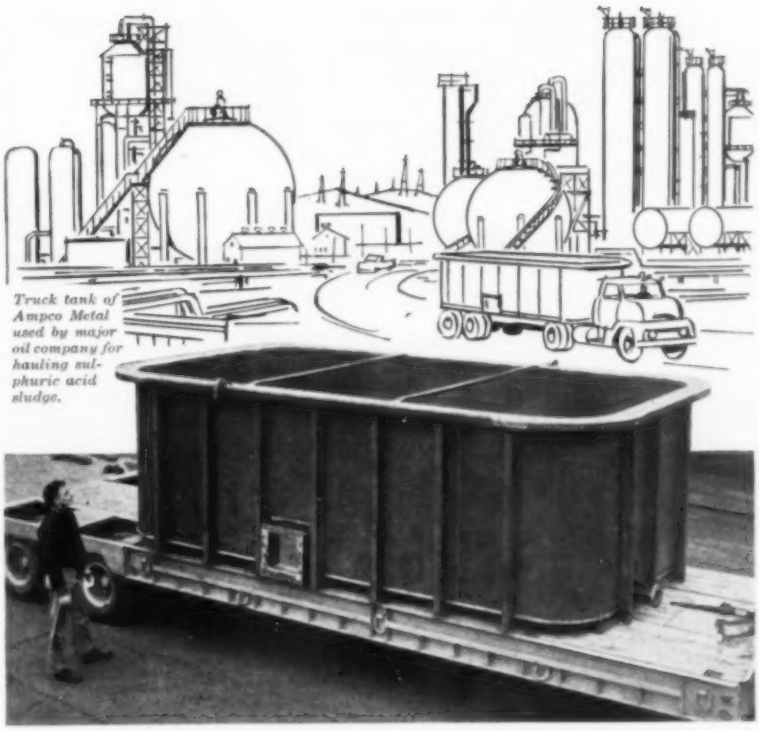
Circle number (51) on reply card.

Corrosion-resistant Coating. Permaspray Manufacturing has developed a corrosion-resistant coating that can be applied by brush, roller or spray. Excellent corrosion-resistant properties, plus several methods of application make possible easy coating of structures and equipment for refineries, chemical plants, petroleum storage tanks, tank cars, tankers, and commercial construction subject to corrosive action. For best protection, 2 coats of Permaspray should be applied, each coat approximately 3 mils thick. *Permaspray Manufacturing Corporation.*

Circle number (52) on reply card.

Titanium Trichloride. Titanium trichloride, previously obtainable only in small quantities for research purposes, is now manufactured on a semi-commercial basis. Titanium trichloride has attracted a great deal of attention because of its potential application as a catalyst for the manufacture of isotactic polymers such as polypropylene, polybutene and polystyrene. It has been cited in the literature as being a promising catalyst for the production of ziegler low pressure polyethylene, of a new cis-polybutadiene rubber, and for use in Friedel-Crafts type reactions. *Stauffer Chemical Company.*

Circle number (53) on reply card.



Truck tank of Ampco Metal used by major oil company for hauling sulphuric acid sludge.

Handles 35% Solution of Hot Sulphuric Acid Sludge

Truck tank...made from Ampco Metal Grade 8 plate...resists corrosion

Ampco Metal resists corrosion, erosion, and cavitation-pitting caused by...

Boiling sulphuric acid (up to 50%)

Hot concentrated caustic solutions

Fatty acids

Hydrofluoric acids

Abrasive solids in suspension

Other problem liquids and abrasives

Ampco Metal has exceptional resistance to the destructive attack of many alkaline and acid media.

That's one reason why this aluminum-bronze alloy is used in fabrications like the truck tank shown here; in pipe, fittings, and other forms.

There are other reasons, also:

(1) Ampco Grade 8 can be readily sheared, bent, formed, or deep drawn.
(2) It is easy to weld with Ampco-Trode* by the metal-arc, carbon-arc, MIG or TIG processes.
(3) It possesses high impact and fatigue strength.

You can get Ampco Metal in sheet, plate, extrusions, sand and centrifugal castings, pipe fittings, fasteners, tubing, pumps, valves, etc.

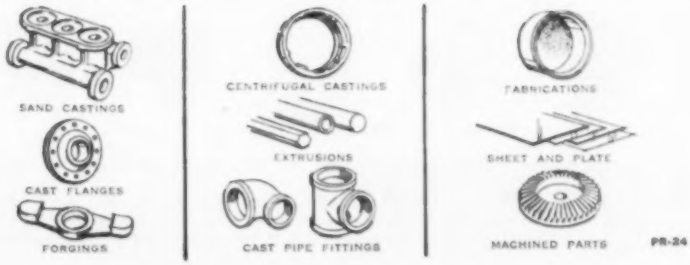
Ask your Ampco field engineer for further facts — or write us. *Reg. U. S. Pat. Off.

AMPCO METAL, INC.

Dept. PE-3, Milwaukee 46, Wis. • West Coast Plants: Burbank, Calif.

AMPCO®

THE METAL WITHOUT AN EQUAL



PR-24

DEMAND TOP PERFORMANCE !

...specify

BARTON 214

DIFFERENTIAL PRESSURE TRANSMITTER

WHEN MODERNIZING YOUR INSTRUMENTATION

The Model 214 D.P. TRANSMITTER incorporates the newest features for accurate, dependable performance in the precise measurement of flow, liquid level and/or differential pressure. Transmits with high speed and sensitivity, and low air consumption, yet is very stable, unaffected by over-range, and is virtually immune to vibration, temperature and pulsation. Ranges from 0-20" W.C. to 0-400" W.C. and S.W.P. to 6000 psig. For further information request Bulletin 214-1 or contact Barton Sales Engineers in principal cities.

for the very BEST IN FLOW BARTON

MODEL 199 METER BODY

MODEL 200 INDICATOR

MODEL 202 RECORDER

MODEL 211-234 FLOW SWITCHES

MODEL 237 CONTROLLER

BARTON INSTRUMENT CORPORATION

580 MONTEREY PASS ROAD, MONTEREY PARK, CALIFORNIA

New Equipment

Positive Displacement Flowmeter. The VAF-BROOKS Flowmeter is designed for hard-to-handle fluids such as bunker oils, still bottoms and asphalt. Meter is available in sizes from 1-in. to 6-in., up to 450 gpm capacity, temperatures to 660 F and pressures to 600 psi. *Brooks Rotameter Company.*

Circle number (54) on reply card.

Weather-protected Motor. Weather-protected motor (Type FOD) for non-hazardous out-door installations in ratings of 250 hp and larger is built into a rigidly constructed fabricated steel frame equipped with 2 removable air ducts. The heavy steel removable air intake ducts have openings at each end. Their design minimizes the effects of high velocity winds and minimizes the entrance of entrained moisture and particles into the electrical parts of the machine.

Air intake ducts are equipped with protective screens just above the intake openings, and discharge openings in the bottom of the frame are baffled and screened. Applications served by the weather-protected motor are petroleum pipeline pumping and refining, chemical plants, power house auxiliary drives, cooling towers, general pumping, mining and mineral processing. *Allis-Chalmers Manufacturing Company.*

Circle number (55) on reply card.

Self-priming Lightweight Pump. Worthington announces a self-priming, self-lubricating centrifugal pump that is lightweight and resists corrosion. Available in three ratings — ½, ¾, and 1 hp — with dual discharge openings for flexibility in piping. Solid aluminum casing, head and impeller makes the pump extremely lightweight (¾ hp unit complete with motor weighs only 62 lb). Pump is the first size of new line of self-priming pumps. Motor and engine driven units will be available up to 6 in. pipe size. *Worthington Corporation.*

Circle number (56) on reply card.

Liquid Meter. New Neptune Repeating Auto-Stop liquid batching meter delivers the same quantity of liquid each time the valve is opened, shutting off automatically when the preset quantity is reached. Quantity setting is changed by pressing Auto-Stop buttons on the register. Meter is designed for production batching and blending operations where the same formula is repeated over and over again. *Neptune Meter Company.*

Circle number (57) on reply card.

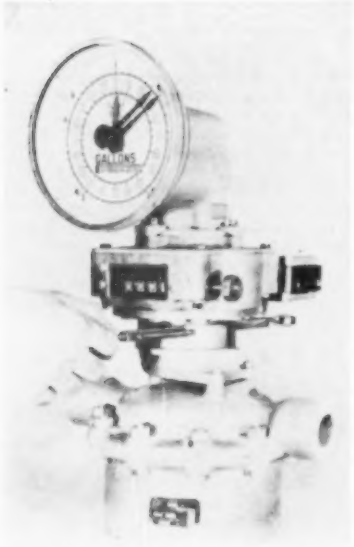
Chemical and Acid Tank Transports. Designed specifically for the chemical and petro-chemical industry, these transports comply with the requirements of ICC regulation MC-311 and to the ASME code and offer the operator the benefits of light weight obtained through its novel external ring design. Design eliminates the necessity of heavy pressure vessel construction required for pressure unloading. *Doyle & Roth Manufacturing Company, Inc.*

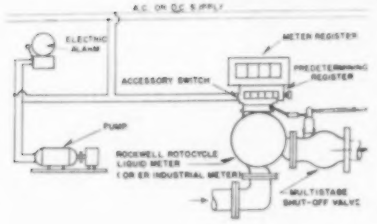
Circle number (58) on reply card.

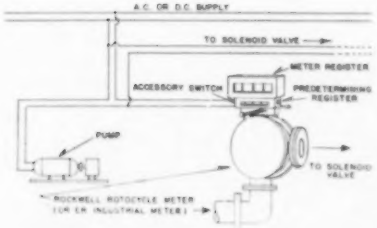
Centrifugal Pressure Pump. Homelite Model 24S3-1P is a centrifugal pressure pump designed specifically for fire departments, contractors, utilities, and general industries.

It has a capacity range of 55 gal of water per minute at 70 lb pressure to 205 gal of water per minute at open discharge. Weighing only 107 lb, unit is easily carried to any location. Crossed-type impeller is designed with large clearances to permit operation in muddy water and constructed of long-wearing cast iron for long service life. *Homelite.*

Circle number (59) on reply card.

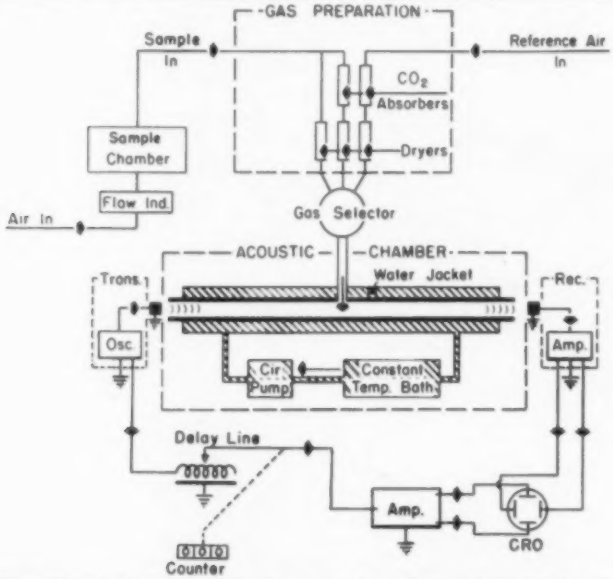






Automatic Control System Adds to Industrial Metering. A new explosion-proof control system which moves petroleum liquid metering a step further toward complete automation provides for automatic switch control of all pumps and quantity control valves at the meter. Upon completion of a predetermined liquid delivery, a switch is automatically thrown, opening an electrical circuit and cutting off simultaneously all liquid flow at the meter and all pumping. Where repeated deliveries of a fixed amount of liquid are required, a special factory-set predetermining register is available. *Meter and Valve Division, Rockwell Manufacturing Company.*

Circle number (60) for reply card.



Sonic Gas Analyzer. A gas analyzer employing the velocity of sound and offering exceptional range, sensitivity, and rapidity of analysis, has been released by National Instrument Laboratories. Monitoring gas mixtures by continuous or batch control, the detection of minute amounts of harmful gases in pollution or personnel safety problems, vapor and gas chromatography, and the study of isotope concentration in certain gases are a few of the Sonic Gas Analyzer's many applications.

Developed by Merck & Company, unit exploits wide differences in sonic velocity by achieving such measurable sensitivities as 0.005 percent of oxygen in air and 0.00061 percent of hydrogen. The usual linking of high sensitivity with limited ranges of gas concentration, typical of other types of analyzers, does not exist in the sonic velocity method. The high sensitivity remains the same over the range of 0 to 100 percent.

Instrument contains a long tube in which the velocity of the sound is measured. The gas is fed into the sonic tube at its center and flows out at both ends, so that the velocity of flow does not increase or decrease the rate of sound transmission. Sound waves are generated at one end of the tube and are received by a crystal transducer at the other end. The phase of the received signal is compared with that of the generating crystal. *National Instrument Laboratories, Inc.*

Circle number (61) for reply card.

MERCOID®
WEATHER RESISTANT
CONTROLS

VISIBLE
CALIBRATED DIAL
ON-OFF SWITCH POSITION
OPERATING POINT INDICATORS

for pressure or temperature

HERMETICALLY SEALED CONTACT
ZINC PLATED STEEL CASE
OUTSIDE ADJUSTMENTS

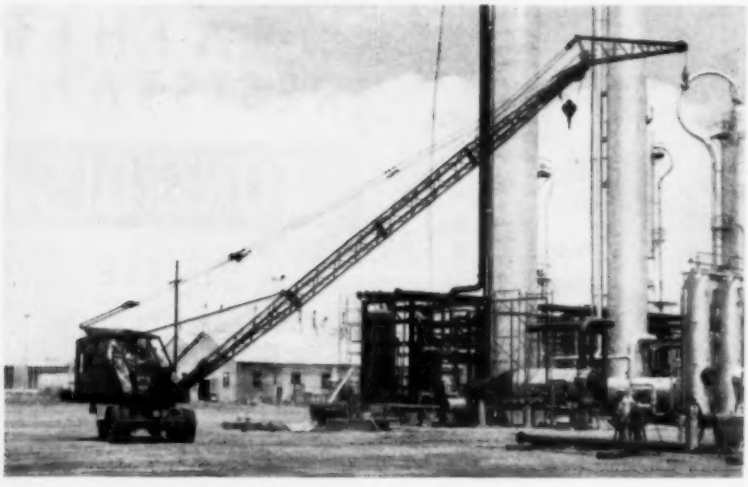
FOR OUTDOOR SERVICE
OR OTHER APPLICATIONS
(NEMA 1A, 2, 3, 4)

Drip Tight
Semi-Dust Tight
Weather Resistant
(Weather Proof)
(Splash Proof)
(Sleet Proof)
(Moisture Resistant)
(Rain Tight)
Weather Tight
(Hose Test)

Write for catalog No. 857W which also lists general purpose controls (NEMA 1) and explosion proof controls (NEMA 7, 9, 9A).

THE MERCOID CORPORATION
4201 Belmont Ave., Chicago 41, Ill.

Speedy **BANTAM**



- great "handy man"
- best for refinery construction and maintenance jobs

Whether it's trenching, backfilling, erecting steel, cleaning ditches, digging sump pump holes, installing or handling pipe—on dozens of tasks around refineries—the versatile, fast-moving BANTAM is your most efficient, low-cost rig.

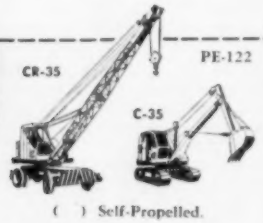
High mobility on crane carrier mounting means that you can go anywhere—fast. Nine different quick-change attachments mean you can answer practically any need for digging —or for lifting loads of 6 and 7 tons. As a crane it gives you safe, precise handling with the ability to "inch" loads into position. Boom lengths available up to 45 feet; power up boom and power controlled lowering is standard.

Refinery users tell us that BANTAM works many places where other rigs can't go. Yet, with all its multi-purpose uses, BANTAM's low cost makes it the most competitive rig on the market. It not only costs less to buy, but less to operate, less to maintain. And it's reliable—the most job-proved machine of its kind.

See your BANTAM distributor or write us for details. Use the handy coupon below.

SCHIELD **Bantam Co.**

286 Park Street, Waverly, Iowa, U.S.A.



Please send data on BANTAM checked below:

( ) Carrier Mounted ( ) Crawler Mounted ( ) Self-Propelled.

Name _____ Title _____

Company _____

Address _____

City _____ State _____

WORLD'S LARGEST PRODUCER OF TRUCK CRANES AND EXCAVATORS

New Literature

Alkalies and Chemicals. A comprehensive, 56-page book containing detailed information on the entire line of Solvay alkalies and chemicals has been announced by the Solvay Process Division, Allied Chemical & Dye. This "Products Book," as it is called, includes informative data on the uses, markets, physical and chemical properties, packaging and handling and storage of the Solvay line. Also included is a listing which groups the products by consuming industries or manufacturing processes. *Solvay Process Division, Allied Chemical & Dye Corporation.*

Circle number (62) on reply card.

Plant Construction. Dravo products and services for the oil and gas industry are presented in a new, 20-page booklet by Dravo's machinery division. Bulletin illustrates many pipe line pumping and compressor stations that have been engineered and constructed by the corporation, including metering and regulating stations. *Dravo Corporation.*

Circle number (63) on reply card.

Combustion Engineers. Catalog on Combustion Controls and Instruments represents a single source of information covering a complete line of automatic controls and instruments for the combustion industry. Informative catalog covers everything required for a complete combustion installation, such as automatic draft-control instruments and actuators; solenoid, diaphragm, and motor-operated valves for oil, gas, steam, and water; time switches, relays, and oil burner primary controls. *General Controls Company.*

Circle number (64) on reply card.

Industrial Television. Eight-page descriptive brochure has just been issued covering Philco's newly designed line of industrial television equipment. Booklet contains many illustrations of the latest developments in cameras, monitors, controls, lenses, and other accessories required to create any kind of camera chain. Included in the new line are cameras with full remote control for adjustment of focus and iris apertures and for both high and low speed tilt and pan. Also listed are special weatherproof and explosion resistant housings as well as various lenses and turret heads. *Philco Corporation.*

Circle number (65) on reply card.

Solvent Decarbonizing. A "paracritical" liquid-liquid extraction process is the subject of a new 16-page "Kelloggram" published by M. W. Kellogg. Process was developed to supplement vacuum distillation and recover a substantially higher percentage of profitable catalytic feed from residues which would otherwise go to fuel or to thermal cracking. *The M. W. Kellogg Company.*

Circle number (66) on reply card.

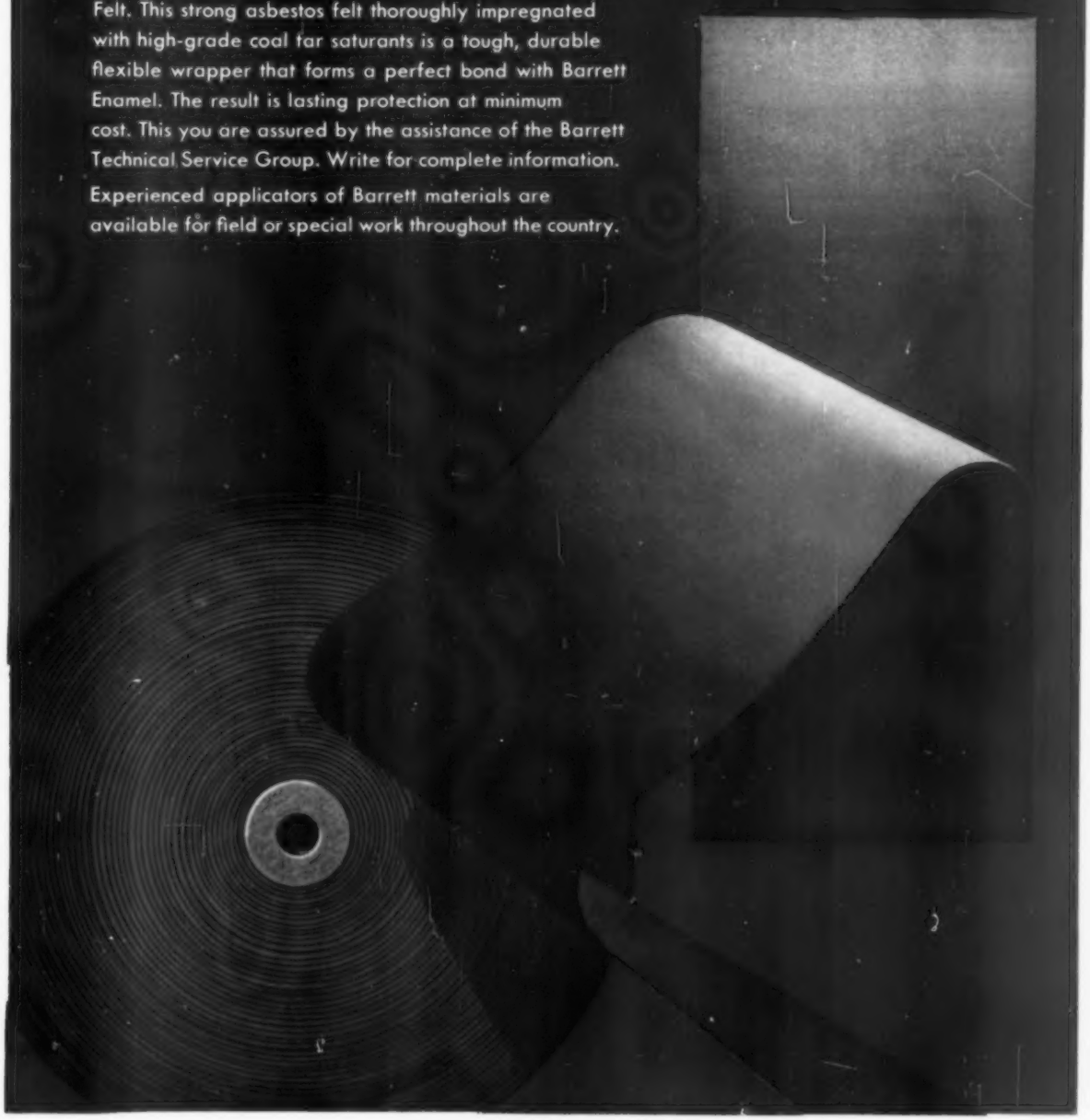
Engineering and Construction. Lummus has released a new 19-page brochure describing their new facilities and picturing a cross-section of recent Lummus projects. They have undertaken a number of challenging and unusual projects both here and abroad. The Lummus Company now designs, engineers and constructs process units anywhere in the world. *The Lummus Company.*

Circle number (67) on reply card.

ALL-AROUND PROTECTION

You get all-around pipe protection with Barrett Pipeline Felt. This strong asbestos felt thoroughly impregnated with high-grade coal tar saturants is a tough, durable flexible wrapper that forms a perfect bond with Barrett Enamel. The result is lasting protection at minimum cost. This you are assured by the assistance of the Barrett Technical Service Group. Write for complete information.

Experienced applicators of Barrett materials are available for field or special work throughout the country.



Barrett®

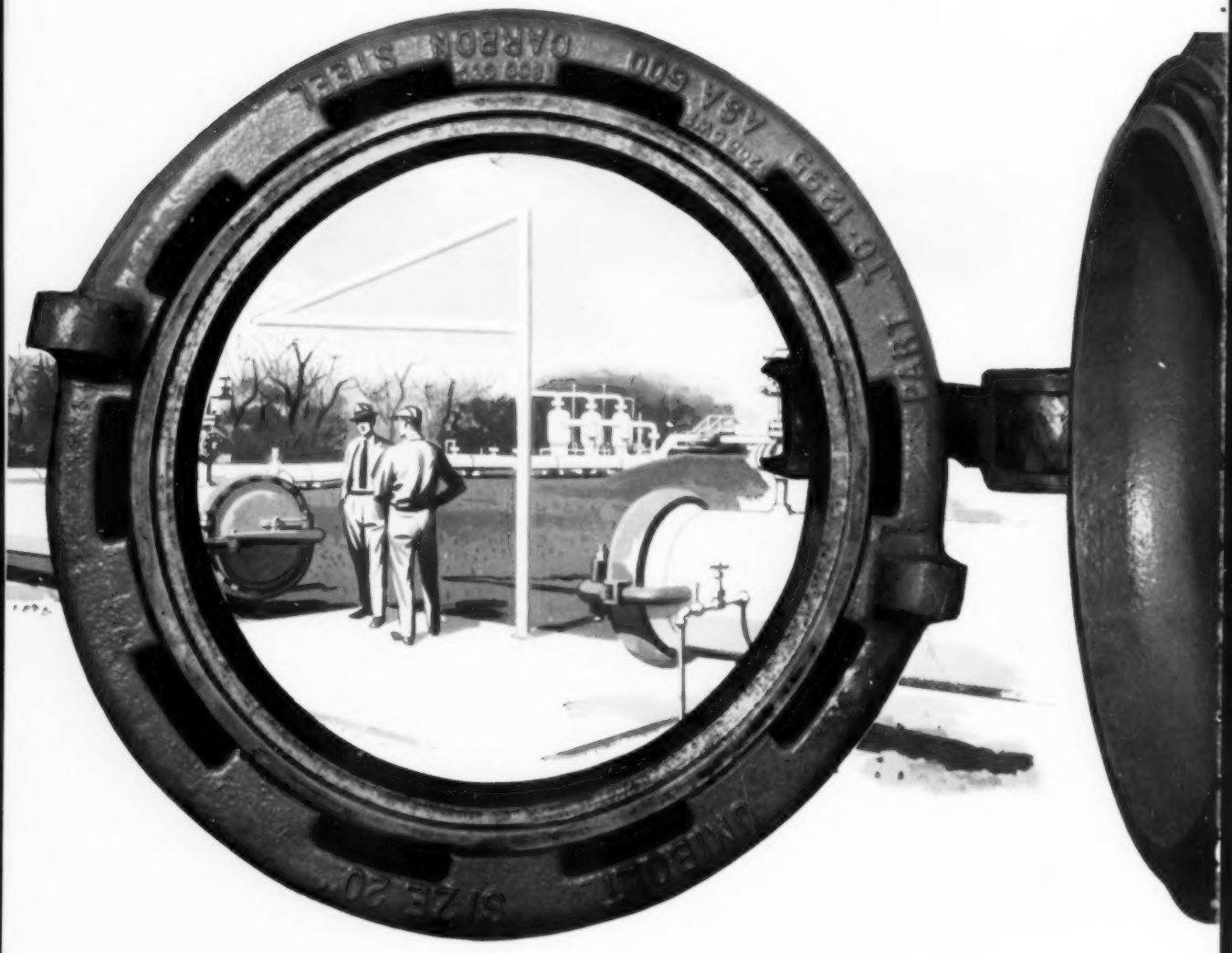
PROTECTIVE COATINGS

BARRETT DIVISION, Allied Chemical & Dye Corporation, 40 Rector St., N. Y. 6, N. Y. In Canada: The Barrett Company, Ltd., 5551 St. Hubert Street, Montreal, Que.

OVER 100 YEARS OF EXPERIENCE

Allied Chemical

THE MODERN VIEWPOINT ON SCRAPER TRAPS



SELF-SEALING GASKET — made of Hycar (oil and gas resistant rubber) — is the final answer to scraper trap leaks. Its lipped design makes it self-sealing under line pressure. The coupling cannot be over-tightened to the extent of damaging the gasket or the coupling itself.

UNIBOLT

No threads to gall or freeze . . . No leaky seals . . . No doubt about strength — it conforms to all codes . . . No multi-bolt flanges.

Release two bolts. Swing the trap open. Take the pig out or put the pig in. Close the trap and tighten two bolts. That's just how simple and easy it is to operate a UNIBOLT Scraper Trap. An over-size barrel (slightly larger than the o. d. of the pig) makes it equally easy to start a pig. Line pressure does the heavy work.

Pipeliners everywhere are using UNIBOLT closures and couplings for scraper traps, blowdowns, strainers, mist removers and other large diameter pressure vessels.

THORNHILL CRAVER CO.
P. O. BOX 1184 **HOUSTON, TEXAS**

PIPELINE DEVELOPMENTS ★ ★ ★

Roundup of Planned and Proposed Construction

The following tables list the company, mileage, pipe size, and location of proposed pipeline projects — crude, products, and natural gas — reported to *The Pipeline Engineer*. Company addresses are given when known.

CRUDE LINES

Name of Company	Miles	Size	Location
Cape Pipe Line Company, Philadelphia, Pennsylvania	200	—	Large diameter line from Delaware Bay to Greater Philadelphia area refineries
Interprovincial Pipe Line Company Toronto 1, Ontario, Canada	151	20	Sarnia to Port Credit, Ontario
	32.6	24	Regina, Saskatchewan, to Cromer, Manitoba
Lakehead Pipe Line Company, Inc. Toronto 1, Ontario, Canada	80	26	Loop from Clearbrook, Minnesota, to Superior, Wisconsin
North-West Oil Pipelines Company	210	—	Wilhelmshaven, on the North Sea, to industrial Ruhr area of West Germany
Northwest Pipe Line Corporation Salt Lake City, Utah	350	8	Four Corners area to Salt Lake City, Utah
Offshore Gathering Company Houston, Texas	364	20	Gulf of Mexico from Sabine Pass to Mississippi River
Pasotex Pipe Line Company El Paso, Texas	127.5	20	New loop on system from Wink to El Paso, Texas
Rangeland Pipe Line Company Calgary, Alta., Canada	450	—	Sylvan Lake Area to Sundre (Central Alberta)
	46.6	12	Northern end of Sundre field to Rangeland main line at Gilby West field
Royal Dutch Shell Group and Others The Hague, Netherlands	870	30	Marseille, France, to Rotterdam, Holland, and Antwerp, Belgium
Royal Pipe Lines, Ltd. Regina, Saskatchewan, Canada	288	Var.	Cantuar area fields to Glenavon
Shell-Standard of California	600	14	Four Corners area to Los Angeles
Sinclair Pipe Line Company Independence, Kansas	150	20	Teague to Houston, Texas
Tecumseh Pipe Line Company Independence, Kansas	190	20	East Chicago, Indiana, to Cygnet, Ohio
Texas-New Mexico Pipe Line Company, Houston, Texas	515	16	Extension from Jal, New Mexico, pump station to Four Corners area
Trans-Border Pipe Line Company	110	—	Skagway, Alaska, to Whitehorse, Yukon Territory

PRODUCTS LINES

Name of Company	Miles	Size	Location
El Paso Natural Gas Company	96.0	8	Gallup to Blanco Plant, New Mexico
El Paso, Texas	290	Var.	Additional line on existing system in Texas, New Mexico, Arizona
Equitable Gas Company and Subsidiaries Pittsburgh, Pennsylvania	100	4–5	Maytown, Kentucky, to Institute, West Virginia
Great Lakes Pipe Line Company, Kansas City, Missouri	84	8	Eau Claire, Wisconsin, laterally from a point on existing lines south of St. Paul, Minnesota
	68	12	To Chicago from juncture of Great Lakes' lines with Badger system. Will supplant existing 6-in. line
Hydrocarbons Pipelines, Ltd. Winnipeg, Manitoba, Canada	800	6-8	Edmonton to Fort William, Canada
North Atlantic Treaty Organization	275	2–8	In northeastern France, between points of Langres, Mirecourt, Strasbourg, Metz, Phalsbourg and Deux Ponts
Northwest Pipeline Corporation Salt Lake City, Utah	350	8	Four Corners area to Salt Lake City, Utah
Ohio Oil Company	—	—	Common carrier line from Wood River, Illinois, to Chicago
Findlay, Ohio	—	—	Connecting line from Robinson, Illinois, refinery to new line
Service-Continental-Sinclair-Phillips	550	—	Salt Lake City, Utah, to Spokane, Washington
Texas Eastern Transmission Corporation Shreveport, Louisiana	1168	16–20	Conversion of "Little Inch" between Beaumont, Texas, and Moundsville, West Virginia
Union Oil Company of California	815	—	Shale Oil Plant, Rifle, Colorado, to Los Angeles area
Winnipeg & Central Gas Company Winnipeg, Manitoba, Canada	210	6	U. S.-Canadian border to Winnipeg

GAS LINES

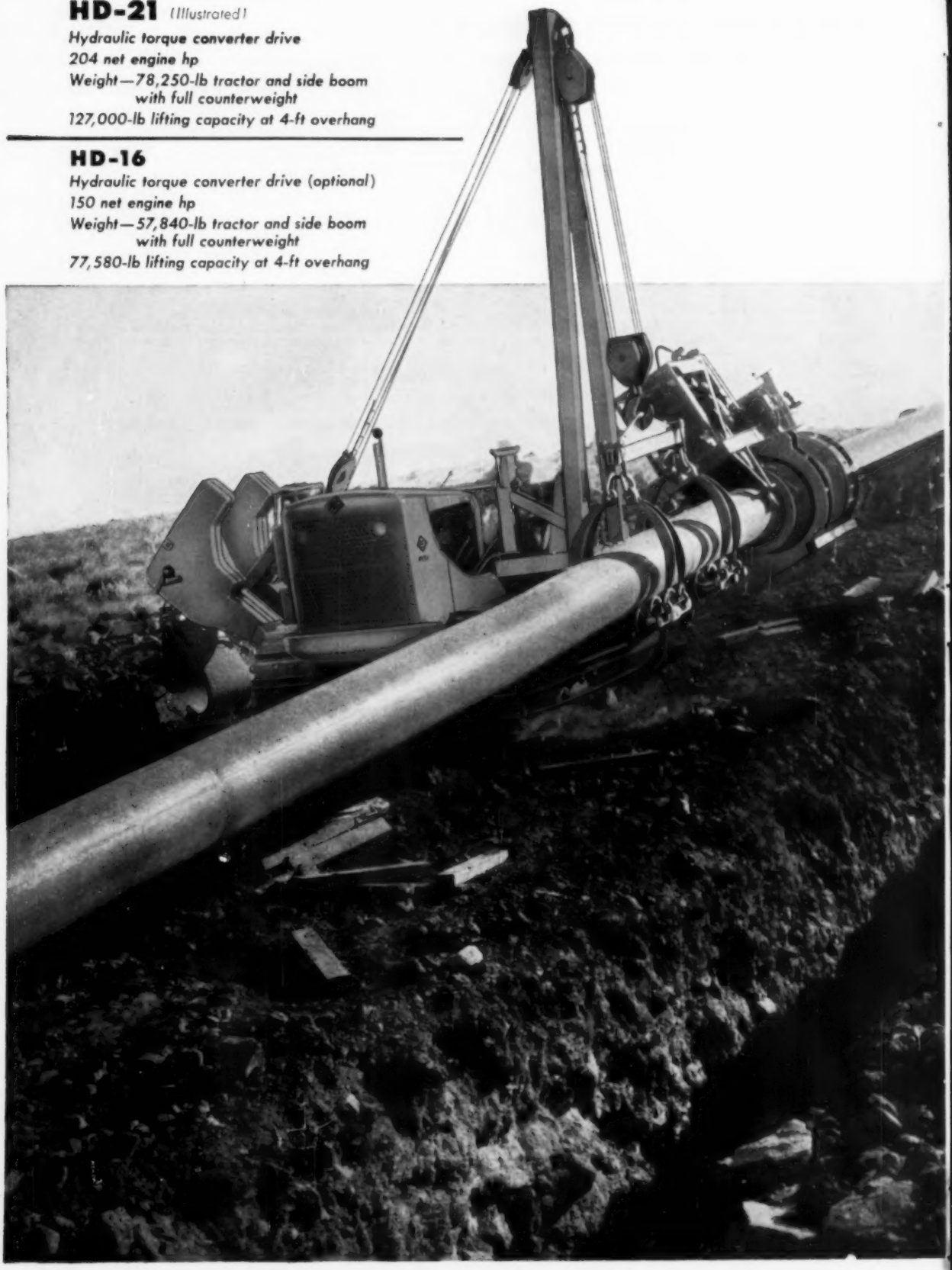
Name of Company	Miles	Size	Location
Andes Pipeline Corporation	500	12	Villamontes, Bolivia, to Antofagasta, Chile
Carolina Natural Gas Corporation Hickory, North Caroline	185	2–12	Additions in North and South Carolina
Cities Service Oil Company Bartlesville, Oklahoma	70	—	Gas gathering system on the Roberts Ranch, Midland, Texas

HD-21 *(Illustrated)*

Hydraulic torque converter drive
204 net engine hp
Weight—78,250-lb tractor and side boom with full counterweight
127,000-lb lifting capacity at 4-ft overhang

HD-16

Hydraulic torque converter drive (optional)
150 net engine hp
Weight—57,840-lb tractor and side boom with full counterweight
77,580-lb lifting capacity at 4-ft overhang



It's easy to handle the pipe when it's easy to control the machine

CRADLING or lowering in pipe on steep hillsides or in mucky swamplands demands a crawler operator's full attention. That's why operators appreciate the many easy-operating features of an Allis-Chalmers crawler tractor and Tractomotive side boom. They provide precise maneuvering with a minimum of effort.

Finger-tip hydraulic booster steering

on the HD-16 and HD-21 requires only 3- to 5-lb pressure on the controls. Self-energizing brakes make brake-clutch coordination especially easy. They require less pedal pressure and take hold with a firm, uniform grip.

Easy-working side boom levers

Counterweights extend or retract smoothly in response to finger-tip pressure, enabling operator to maintain precise balance even on rough terrain. Side boom levers are within easy reach of operator and spaced to give ample hand room.

Matches speed automatically

The operator merely advances or retards throttle to synchronize tractor speed to that of cleaning-priming or doping-wrapping machines. There's no need to shift or slip the clutch with Allis-Chalmers hydraulic torque converter drive. Operator's hands are free for side boom work. Hydraulic torque converter drive, pioneered and proved in crawler tractors by Allis-Chalmers, is standard on the HD-21 and optional on the HD-16.

Greater operator comfort

Add to these advantages roomy, adjustable cushion seats, wide arm rests, electric starting, and it's easy to see why an operator does more with less effort when he's behind the controls of an Allis-Chalmers-Tractomotive combination. Let your dealer prove it with a demonstration.

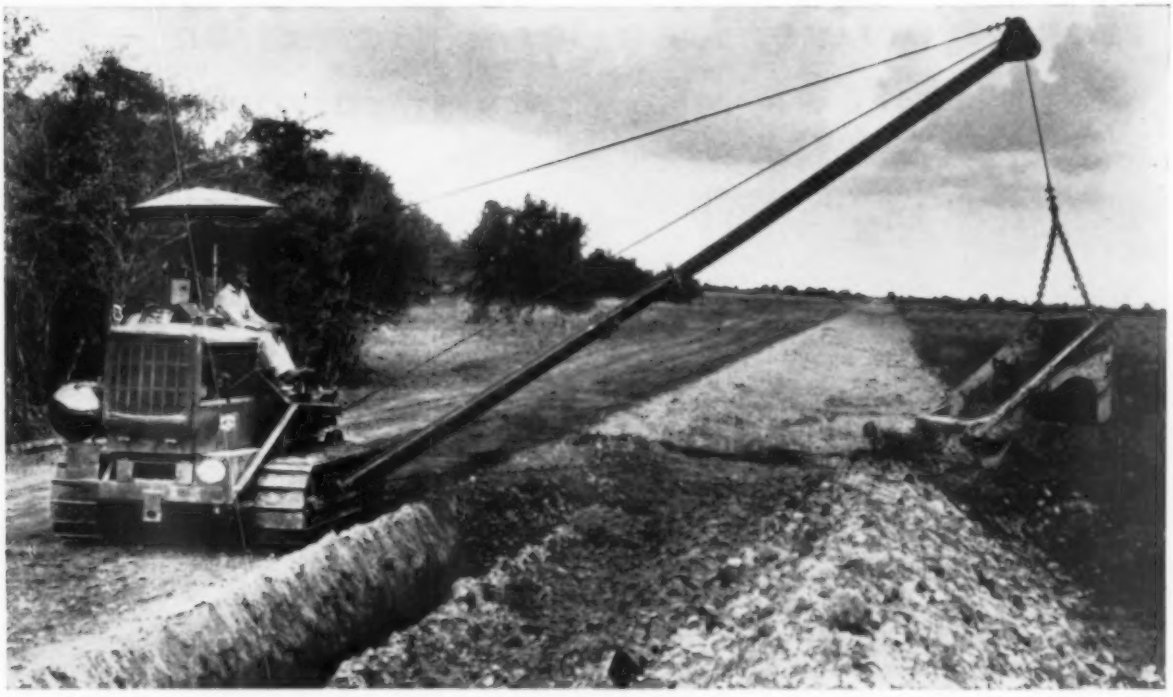
TRACTOMOTIVE CORPORATION, DEERFIELD, ILLINOIS

TRACTOMOTIVE

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION
MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

Name of Company	Miles	Size	Location
Cities Service Gas Company, Oklahoma City, Oklahoma	60	4–12	In Eureka area of Grant and Alfalfa counties, Oklahoma
Coastal Transmission Corporation Dallas, Texas	574	22-26	McAllen, Texas, to Baton Rouge, Louisiana
	414	Var.	Gathering lines in Rio Grande Valley, Texas
Colorado Interstate Gas Company Colorado Springs, Colorado	345	30	Kit Carson, Colorado, to Beatrice, Nebraska
	100	24	Springfield to Pueblo, Colorado
	50	22	Hooker to Mocane and Laverne fields, Oklahoma
	24	24	Greenwood to Panhandle-Kit Carson loop
	109	20	Loop from Fourway, Texas, to Springfield, Colorado
	106	24	Loop from Springfield to Kit Carson, Colorado
	10	16	Keyes field, Oklahoma, to mainline
	6	10	Tablerock field, Wyoming, to mainline
	48.0	4–16	Additions in Mocane field, Oklahoma
	12.0	12–22	Additions in Texas Panhandle fields
El Paso Natural Gas Company El Paso, Texas	83.8	34	Loops to San Juan mainline extending from San Juan County, New Mexico, to Topock, Arizona
	20.5	30	Loops to existing Permian-San Juan mainline from Bluewater station to San Juan mainline in McKinley County, New Mexico
	8.3	26	Loops to California mainline in Yuma County, Arizona
	28.5	30	Field transmission line in San Juan Basin, New Mexico
	78.8	18	Field line from Carson County, Texas, to Moore County, Texas
	22.5	20	South Andrews field booster station to plant
	8.5	16	Shell plant to Goldsmith station
	290	—	To deliver additional gas to three California customers. New gas to come from San Juan Basin and Panola and Permian Basin fields in Texas.
Houston Texas Gas & Oil Company Houston, Texas	942.6	12-30	Baton Rouge, Louisiana, to Miami, Florida
	682	—	Laterals to serve Florida distributors, industrial users
Kansas-Nebraska Natural Gas Company Phillipsburg, Kansas	61.3	Var.	Gathering lines from Camerick field to Liberal, Kansas
Kansas-Nebraska Natural Gas Company, Inc. Hastings, Nebraska	10	10	Grand Island to Fullerton, Nebraska
	10	8	Loop from Grand Island to Fullerton, Nebraska
	11.5	12	Replacement from Scott City to Oakley, Kansas
	1.2	6	Additions to system in Nebraska
	9	8	Lexington to Central Nebraska Public Power Electric Plant
	14	16	Replacement from North Platte to Maxwell, Nebraska
Michigan Wisconsin Pipe Line Company Detroit, Michigan	31	4-6	Looping in Michigan and Indiana
Midwestern Gas Transmission Company	1112	12–24	Mainline from U. S.-Canadian border near Emerson, Manitoba — Noyes, Minnesota, to Portland, Tennessee
	648	3–18	Laterals of mainline to serve communities in Minnesota, North Dakota and Wisconsin
Natural Gas Pipeline Company of America Chicago, Illinois	349	20–26	Jack and Wise counties to Fritch, Texas
	38	36	Joliet to Elgin, Illinois
	405	36	Beaver County, Oklahoma, to Joliet, Illinois (loops)
	25	—	Gathering line from Quinduna field, Roberts County, Texas, to point on existing line
	91	30	Loops in Nebraska, Kansas, Oklahoma
Northern Natural Gas Company Omaha, Nebraska	28	24	Ogden to Redfield storage area, Iowa
	168	20	St. Paul-Minneapolis to Duluth, Minnesota, and Superior, Wisconsin
	307	Var.	Branch lines in South Dakota, Minnesota, Iowa and Wisconsin
	100	20–24	Savannah Creek field, Alberta, to Alberta-Montana border near Cardston, Alberta
Northern Plains Natural Gas Company (subsidiary of Northern Natural Gas Company) Omaha, Nebraska	1100	26	Alberta-Montana border to Minneapolis, Minnesota
Offshore Gathering Company Houston, Texas	364	30	Offshore gas line in Gulf of Mexico from Sabine Pass to Mississippi River
Pacific Gas & Electric Company San Francisco, California	200	12	Glenn and Tehama counties to Eureka and Arcata, California
Pacific Lighting Gas Supply Company Los Angeles, California	80	30	Coles Levee to Newhall, California
	2.1	16–20	Potrero to Newhall, California
	2.8	16	Lines in East Whittier, California
Tennessee Gas Transmission Company Houston, Texas	100	—	New gathering lines in Texas and Louisiana
	557	30	Mississippi River Delta south of New Orleans to Portland, Tennessee
	120	12,20,26	Kinder, Louisiana, south 68 miles into Gulf of Mexico
	332	24–30	Loops in Kentucky, West Virginia, Pennsylvania, Tennessee
	76	24	Coudersport, Pennsylvania, to Buffalo, New York
	299	Var.	Adding to existing systems in Ohio, Pennsylvania, Kentucky, Texas and Louisiana
Texas Eastern Transmission Corporation Shreveport, Louisiana	530	30	Loops from Kosciusko, Mississippi, to Uniontown, Pennsylvania
	10	12	Loop from Broadaxe Junction to Levick Street, Philadelphia, Pennsylvania
	6	12	Loop from Broadaxe Junction to Conshohocken, Pennsylvania
	5	10	South Plainfield to Highland Park, New Jersey
Texas-Illinois Natural Gas Pipeline Company Chicago, Illinois	59	20	Joliet to Volo, Illinois
Trans-Canada Pipe Lines, Ltd. Calgary, Alberta, Canada	1675	30–34	Winnipeg to Montreal and laterals
Transcontinental Gas Pipe Line Corporation Houston, Texas	350	24,30,36	Louisiana, Mississippi, Alabama, Georgia, South Carolina, North Carolina, Virginia, Maryland, Pennsylvania
	28.5	16	Gathering system in Gulf of Mexico, off Louisiana Coast
Westcoast Transmission Company, Ltd.	174	30	Line from Savannah Creek gas field, Alberta to existing system



One-man-operated CLEVELAND 190 backfills pipeline *"almost as fast as man can walk"*

Much of this United Gas pipeline from the Chocolate Bayou field to the main line near Webster, Texas cuts through rice-growing farmlands. To avoid interference with the placement of water canals, the 42-inch wide trench had to be dug extra deep—to an average of approximately 7 feet—forming big heavy spoil banks of wet sticky gumbo in many places. Along much of the 16-mile line, the trench also was filled with underground water which seeped in from the rice fields.

In spite of these adverse conditions, a Cleveland 190 backfiller helped Fowler-Tatom Pipeline Contractors keep the job moving at a good rate, leaving no open trench at the end of any day's work. Working right on the heels of the lower-in crew, the one-man-operated 190 tied down pipe in the water-filled trench, then doubled back and completed the fill and finished it off with a neat clean-up job. The job report states, "The Cleveland 190 backfilled trench almost as fast as a man can walk." Because it never has to leave the right-of-way to do any part of its job, the 190 was also a big factor in getting this job done with no off-right-of-way damage.

BUILT FROM THE GROUND UP TO DO ALL YOUR BACKFILLING...BETTER

- One-Man-Operated
- 79 H.P., 467 Cubic Inch Diesel Engine
- Perfect Balance, Low Ground Pressure
- 4 Backfill Line Speeds
- Telescopic Boom, 19′ to 27′
- Hydraulic Boom Hoist
- Hydraulic Steering Brakes
- Hydraulic Backfill Clutches
- 7′ x 3½′ Backfill Board
- All speeds (1 fpm to 4.3 mph) in Either Direction

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THE CLEVELAND TRENCHER COMPANY

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For effective, long-term protection against corrosion . . .

Close-up of Transhield Asbestos Pipe Line Felt, showing parallel-spaced glass yarns.

Coating and wrapping pipe line to check corrosion and assure long-term service.

. . . use Johns-Manville TRANSHIELD® ASBESTOS PIPE LINE FELT

Johns-Manville Transhield is an economical pipe line felt assuring effective, long-term protection against corrosion under average soil conditions.

Designed for easy, high-speed application by modern machine methods, Transhield is strong and highly tear-resistant. Its light weight permits its use in 800-ft. rolls. This advantage cuts roll changes in half for field wrapping equipment.

Transhield provides a protective membrane of coal-tar saturated asbestos felt, reinforced with continuous glass yarns parallel-spaced on ¼" centers. It cannot rot or decay, thus acts as an enduring barrier to shield pipe line enamels from earth loads and soil stress.

For severe soil conditions use Johns-Manville #15 Asbestos Pipe Line felt . . . proven in service for over 30 years.

For further information about Transhield, write to Johns-Manville, Box 14, New York 16, N. Y. In Canada, 565 Lakeshore Road East, Port Credit, Ont.

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- Crawler rollers and tumblers sealed against dirt
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- Increased stability and flotation with 12′6″ crawlers and 24″ or 30″ shoes
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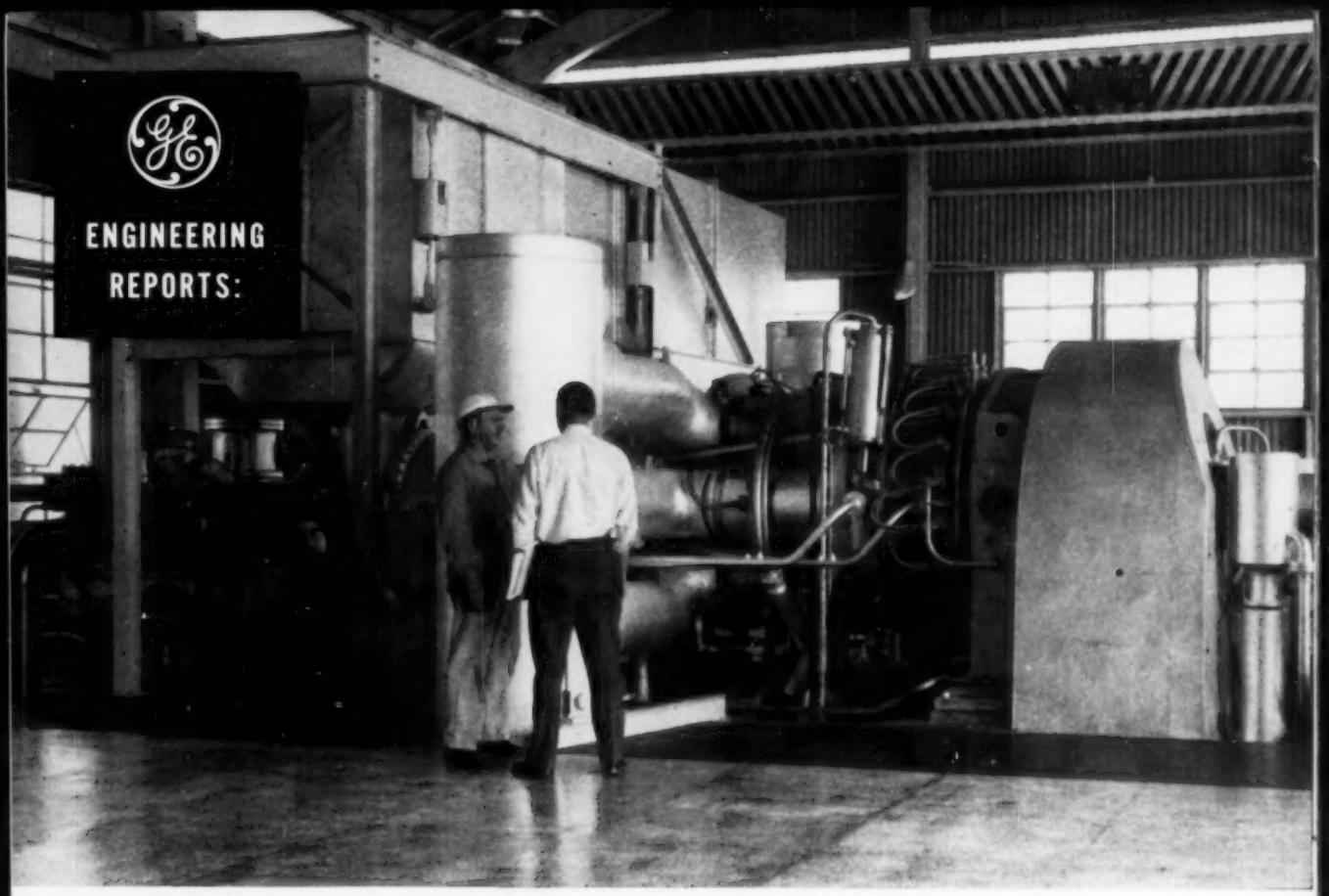
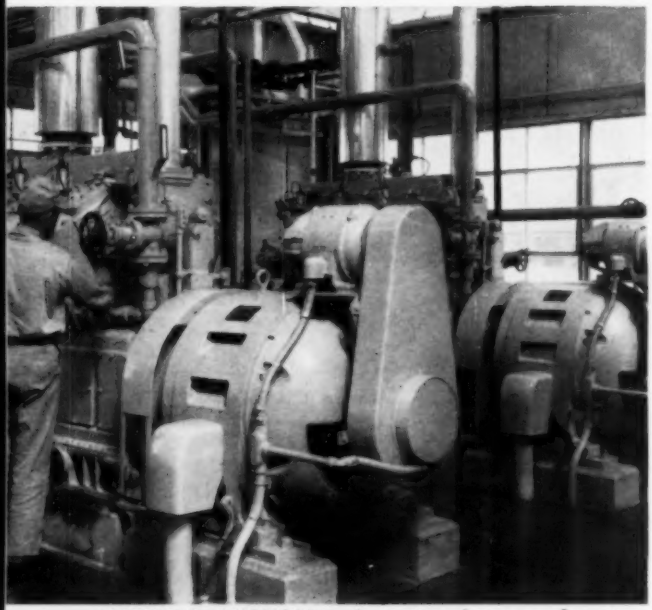
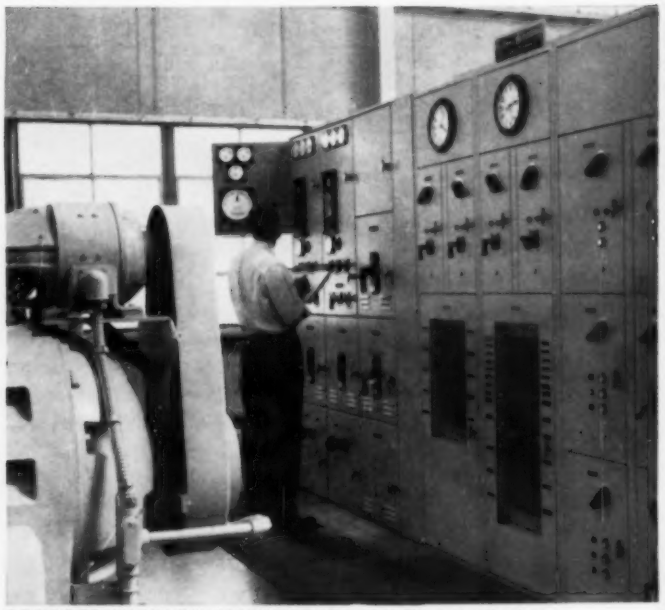


Powered by General Electric engineered drive system . . .

Tennessee Gas Transmission uses parallel

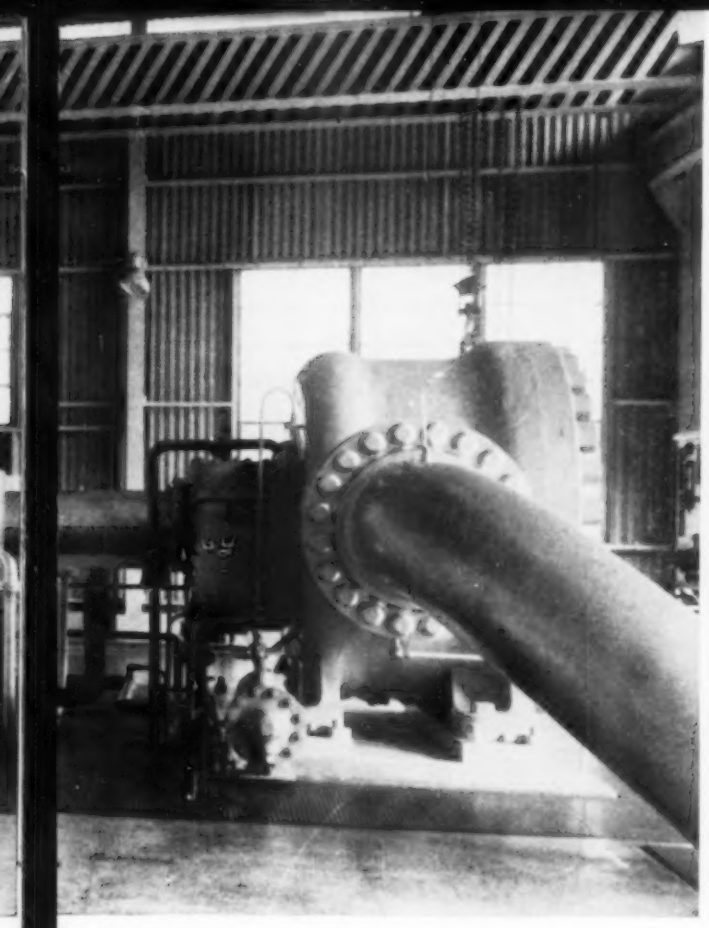


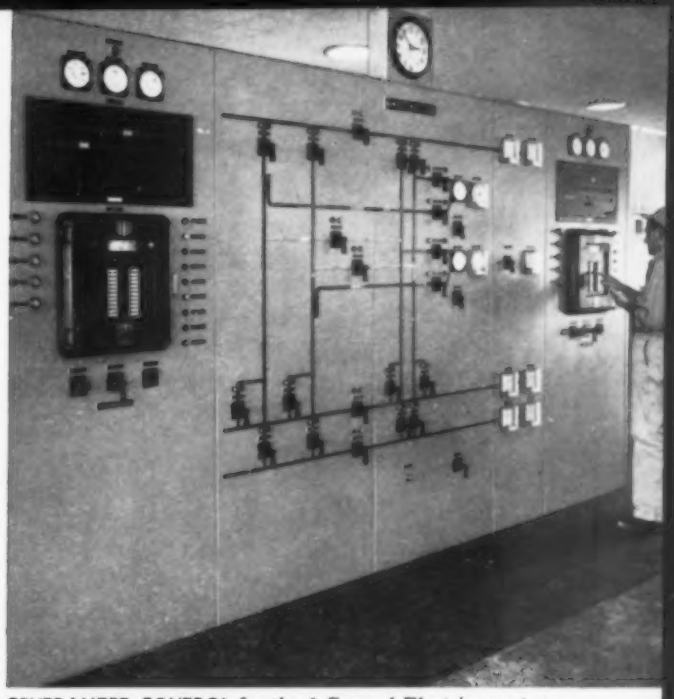
AUXILIARY ELECTRICAL equipment receive power from two General Electric 187-kva, engine-driven, a-c generators which supply 480-volt, 60-cycle power for the station system.



COMPACT, FACTORY ASSEMBLED General Electric Cabinetrol* panel centralizes control of station's auxiliary equipment, was planned to take up minimum valuable floor space.

*Reg. trade-mark of General Electric Co.

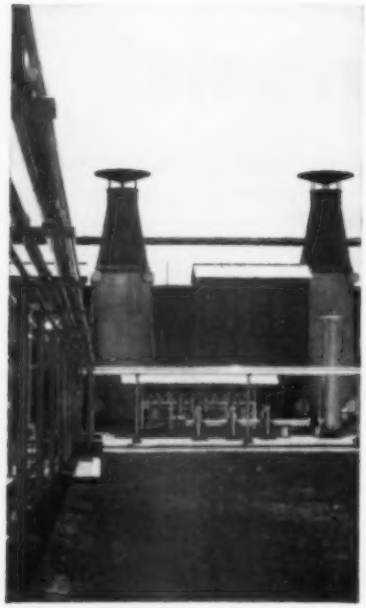




CENTRALIZED CONTROL for the 2 General Electric gas turbines is located in accessible, duplex control panel. Panel provides semi-automatic operation, requires little supervision.

PARALLEL COMPRESSOR ARRANGEMENT, first in the industry, permits two 6700-hp gas turbines to handle station's prime mover requirements for 4-season, lower cost operation.

compressor arrangement in Morehead station



TURBINE EFFICIENCY is increased with regenerators, located outside new station, that "recapture" exhaust heat.

General Electric engineered compressor drive system, with two 6700-hp gas turbines, helps lower new station's operating costs

The Tennessee Gas Transmission Company's new Morehead, Kentucky, pipeline station has two centrifugal compressors arranged for parallel flow, to provide highly flexible operation. With this arrangement—an industry first—the adjustable speed compressors provide a wide range of flows and piping combinations with high stability.

THE DRIVE SYSTEM was installed to meet the station's individual compression requirements and to help lower operating costs. Speed adjustment of the turbines, to meet seasonal increases in compressor load, is easily accomplished. The station has lower maintenance and operator requirements. In addition, the gas turbine fundamental characteristic of increasing horsepower, with decreasing ambient temperature, means that up to 25% more horsepower is available to meet cold weather's increased load requirements.

WHEN YOU EXPAND your compressor facilities, General Electric has a complete line of engineering services also available to you, to help you and your consultants install a drive system engineered for your particular requirements. Your Apparatus Sales Representative, at the nearest General Electric Apparatus Sales Office, will give you complete information. Contact him early and write for bulletin GEA-5962 to General Electric Co., Section 661-54, Schenectady, N. Y.

Engineered Electrical Systems for Pipeline Pumping

GENERAL ELECTRIC

COMPRESSION RING . . . 1-piece, quick-seating. Maximum strength. Turned finish on outside diameter lets ring conform readily to the cylinder bore. The chemically treated surfaces aid rapid seating, no scuffing or scoring during run-in. ½" to 120" diameters.

POROUS CHROME PLATED RING . . . exclusive Van der Horst process. Shallow porosity on cylinder contacting surface facilitates break-in, holds and distributes oil during this critical period. Lasts four times longer, cuts cylinder wear up to 75%. ½" to 42" diameters.

CONFORMABLE OIL RING . . . maintains constant pressure for positive oil control. Conforms to meet cylinder distortion; flexible cast iron member, pressed outward by abutment type spring exerts uniform radial pressure around entire circumference. 4" to 25" diameters, ¼" min. width.

KOPPERS SEAL RING . . . has one or two projecting bands of bearing bronze inserted in contacting face. Very quick-seating. Tends to prevent blow-by in new or worn cylinders. The burnishing action of bronze on cylinder walls decreases scuffing and wear. 2" to 30" diameters.

GROOVED OIL CUTTER RING...valuable where oil control is a major problem. Two bevels for riding over oil on up-stroke, two scraping edges for removing excess oil from walls on downstroke, plus a series of wide drainage slots. 1½" to 25" diameters.

Five Koppers Rings . . . worth their weight in gold!

What will American Hammered Industrial Piston Rings *do for you?* They'll save you money on fuel, on lubricating oil, on labor costs—by reducing down-time.

They'll maintain high compression, improve your operation, give you *much* longer service. They don't cost much . . . but they have over 35 years of manufacturing skill and accumulated experience behind them. They never let you down, they never fail in the jobs they're designed to do—and hundreds of satisfied users will tell you that, despite their low cost, Koppers rings *are* worth their weight in gold.

American Hammered Piston Rings are available in all types, all sizes—from ½" to 10' diameter—for every purpose. Koppers makes American Hammered Rings for all kinds of industrial equipment, can recommend without bias as to types. It costs nothing to consult Koppers—for illustrated Piston Ring booklet write to KOPPERS COMPANY, INC., *Piston Ring & Seal Dept.,* 1703 Hamburg Street, Baltimore 3, Md.

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AMERICAN HAMMERED
Industrial Piston Rings

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Dig 16 to 26 inches wide . . . . . with Parsons 150 Trenchliner®

5¾ feet deep

Precision grading accuracy is important on pipeline work — and you get just that with this heavy-duty 150 Trenchliner. Hydraulic ram on vertical mast raises and lowers the digging wheel. It gives infinite depth selections — maintains close grade tolerance in toughest digging. A separate ram tilts the mast — balances weight of wheel forward when traveling or trailer-loading.

For all its fractional-inch accuracy, Parsons 150 has plenty of speed and capacity. 30 digging speeds range from 12 inches to 25 feet per minute, at widths from 16 to 26 inches — depths to 5¾ feet. Dual-purpose friction clutch drives the digging wheel, and automatically protects against shock loads. Heavy cast-steel buckets with "Tap-In" teeth are interchangeable with gumbo buckets. Shiftable, reversible conveyor discharges spoil to either side. Standard tractor crawlers have 16-inch grouser-type treads, provide plenty of sure-footed digging traction on cross-country work. Yet, ground-bearing pressure is low — only 6.3 pounds p.s.i. For power, you have a choice of standard-make gas or diesel engine.

Better check how this 150 wheel-type Trenchliner can put you miles ahead on main-line trenching, gathering-lines, and laterals. Call Parsons distributor, or send for new catalog. (Other sizes include ladder-types, on crawlers or rubber tires — and wheel-type "big-inch" and "middle-inch" Trenchliners.)

Buckets and side-cutters on all Trenchliners are equipped with Parsons double-point "Tap-In" teeth. It takes less than a minute to reverse or replace a tooth. You just drift out the old tooth, reverse it, or tap in a new one. It's self locking, held in place by precision-fit taper. Easily inserted. There are no bolts to tighten — no edges to crimp.

Mail to: PARSONS COMPANY, Newton, Iowa *(Koehring Division)*

Send us: ☐ spec. sheet ☐ catalog on 150 wheel-type Trenchliner

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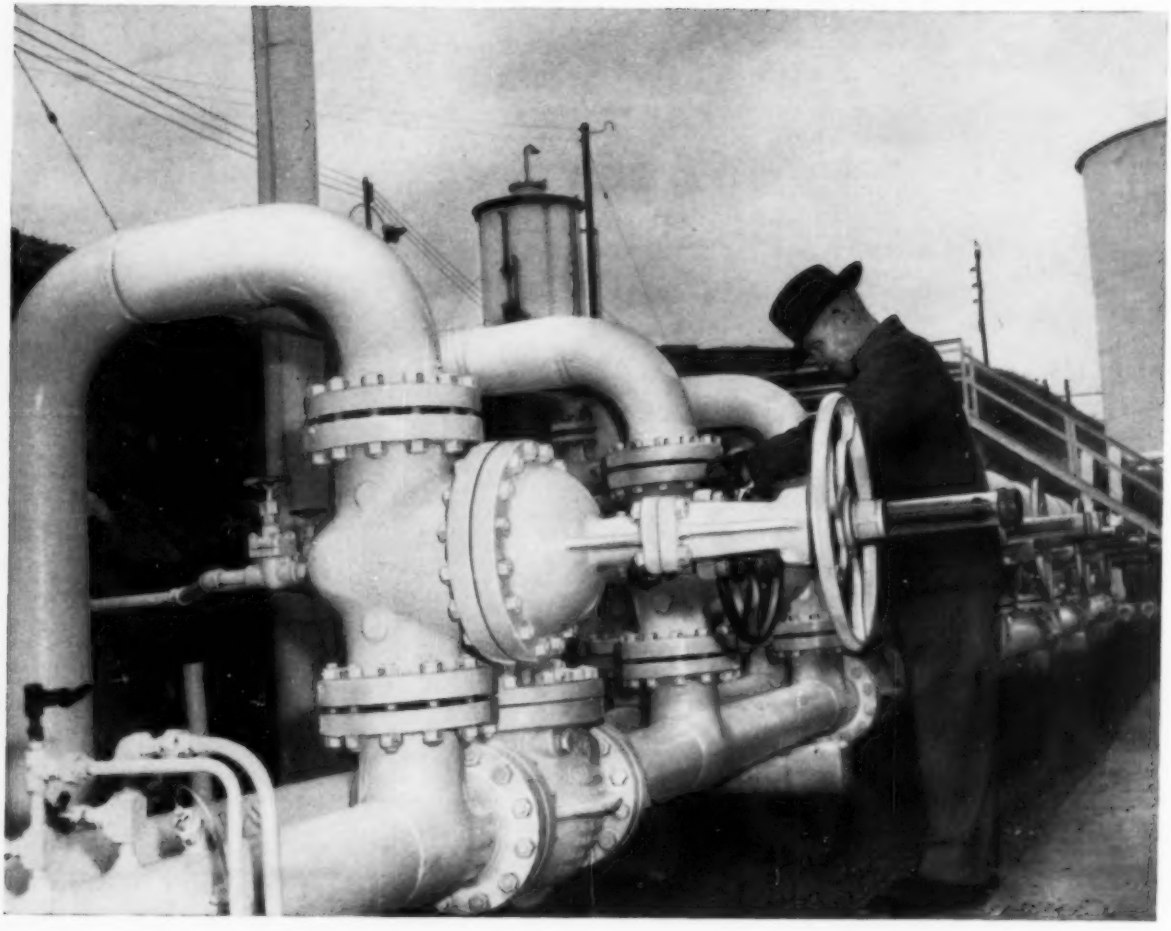


How one Crane valve gives double block protection at half the cost

Each of these Crane valves is doing the work of two.

The valves are Crane 61 XU 400-pound steel gates modified with flexible wedge disc. They're installed in the pump manifold at the Borger main pump station of Phillips Pipeline Company's Borger-Chicago products line. This line was looped in 1951 to handle dissimilar products.

The header consists of 13 eight-inch valves, each with a telltale bleeder connection at the bottom. Depending on the product being handled, inlet pressure on the upstream side of a closed valve may be from 20 to 200 psi. Downstream pressure may go as high as 1100 psi. With the bleed valve open to atmosphere, there is *no leakage*.

Double-blocking is accomplished with a *single* valve fitted with a bleed line, cutting installation costs in half. Station personnel have half as many valves to operate. Product contamination is eliminated.

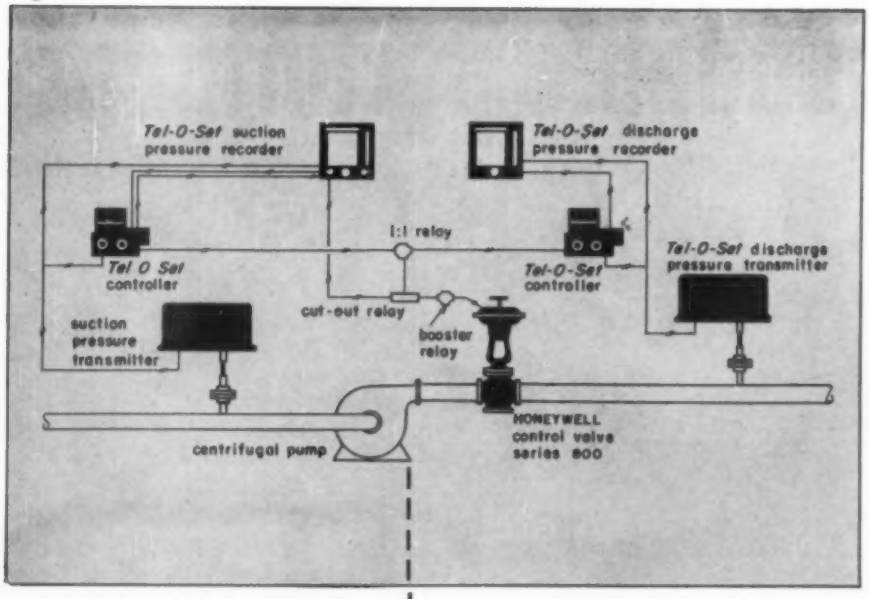
If you have a valve application where double valve, or valve and blind with bleeder, is indicated, why not get the facts on Crane flexible wedge disc gates?

Just ask your local Crane representative or write to the address below.

CRANE VALVES & FITTINGS

PIPE • KITCHENS • PLUMBING • HEATING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas



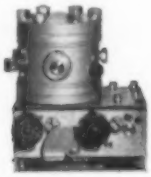
Typical *Tel-O-Set* instrumentation for a centrifugal pump uses a combination of transmitter, recorder and controller for both suction and discharge pressure. Systems are interlocked through a relay to operate a Honeywell Series 800 control valve.

***Tel-O-Set* transmitter**

sends air signal to recorder. It's fast, accurate, compensated for changes in ambient temperature and pressure. Zero and span readily adjustable.

***Tel-O-Set* recorder**

is accurate, sensitive, compact. All adjustments made from front of panel. Complete chassis is replaceable . . . no loss of control. 30-day chart record.



***Tel-O-Set* controller**

has fast response, is unaffected by vibration. Disconnects at turn of a single switch. Each sub-assembly is a precalibrated unit, interchangeable in seconds.

FULL-TIME CONTROL

...For Pipeline Pumping Stations

Put a *Tel-O-Set* control system to work on your pumps—and you're sure of uninterrupted service. When instrument maintenance is needed, the job gets done in seconds.

The reason: transmitter, recorder and controller are designed with quickly interchangeable unit sections. You just put in a new, precalibrated unit when needed.

In performance, too, *Tel-O-Set* miniature instrumentation leads in every respect. It's accurate, sensitive, rugged. It's exceptionally easy to tune for peak operation.

Find out from your local Honeywell sales engineer how *Tel-O-Set* instruments can be applied to your station. Call him today . . . he's as near as your phone.

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First in Controls

For dependable performance

Buckeye's Model 51 pipeline ditcher is a familiar sight on big cross-country jobs. The 51 has established a world-wide reputation for dependable performance. You can count on this same kind of performance in every ditcher that bears the Buckeye brand. Check the complete line . . . you'll find a size and type to meet your exact ditching requirements.

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PLANTS IN WAYNE AND YPSILANTI, MICH.;

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Performance, the kind you can count on regardless of job conditions, demands advanced design as well as quality construction of equipment. You get both when you go Gar Wood-Buckeye!

In Gar Wood-Buckeye ditchers you'll find performance features that insure maximum production. Buckeye's efficient transmission means that more of the power you paid for is delivered to the digging wheel. Simple, grouped controls let the operator put this power to work easily, without studying complicated diagrams. And, Buckeye ditchers are as easy to maintain as they are to operate. They're built to take the punishment of grueling cross-country work . . . designed for easy adjustment and, when needed, quick replacement of component parts.

If your work demands performance you can count on, take a *good* look at the complete Gar Wood-Buckeye line. Call your dealer, or write to: Customer Service Dept., Gar Wood Industries, Inc., Wayne, Michigan.

Gar Wood - St. Paul dump bodies and hoists can take it, in rough going. Bodies are reinforced at key stress points . . . can't spread, sag or warp. Twin lift-arms on "Strong-Arm" hoists are integrally welded to a torque-tube. No one-sided lifting strains, because parts move as a unit. Quickly and easily serviced with regular truck tools!

Gar Wood Dozecasters give you production you can count on in pioneering, clearing and backfilling operations. Screw-type thrust arms provide easy adjustment . . . are attached with "deep-anchored" lugs that can't bend. Heavy-duty swivel bearing lets one man angle blade. Gar Wood's cable-control unit offers quick, accurate control of the 18-ft. Dozecaster moldboard.

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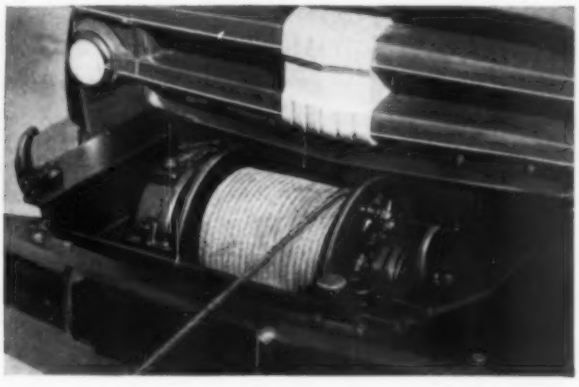

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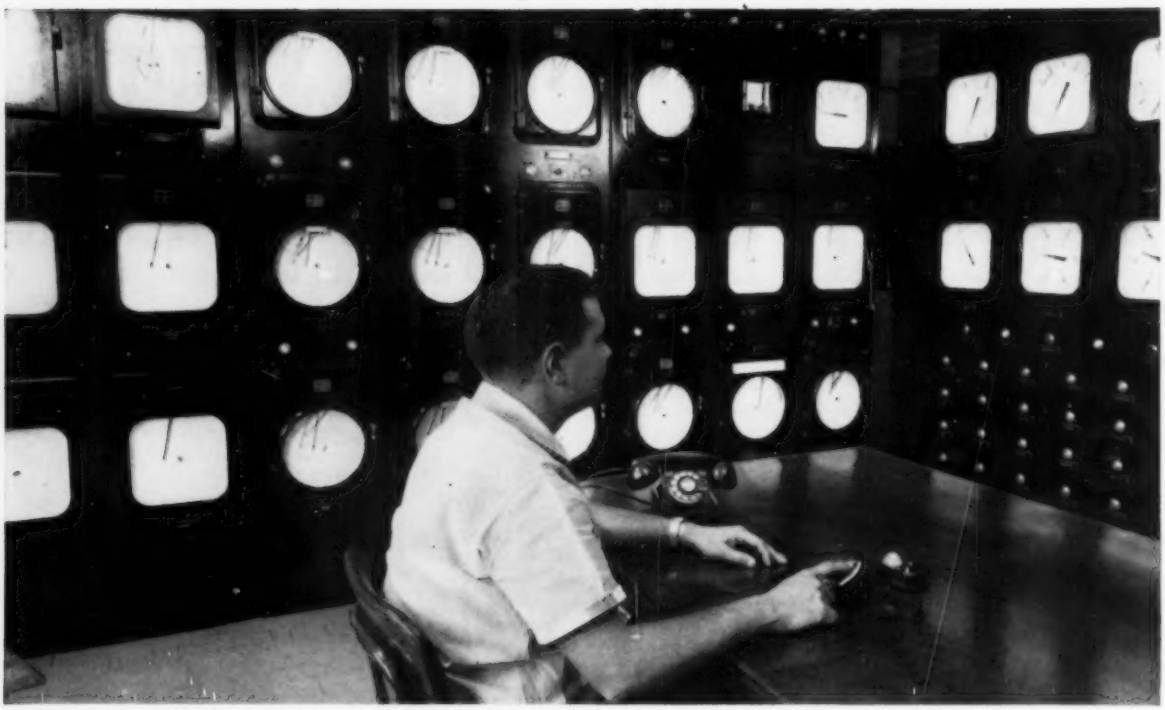

Bell System *selective calling* is used by the dispatcher of Mississippi Valley Gas Co. By flipping a switch, dialing the number of a distant metering point and reading a meter, he knows the pressure, flow and temperature at any of the company's 21 field points.

"When you're sure how much you have, you know how much you can sell"

J. H. Lambdin, Vice President—Operations, Mississippi Valley Gas Company

Bell System telemetering channels provide data on which Mississippi Valley Gas Co. can regulate flow to within 1% of a 60,000 MCF supplier contract limit. With this up-to-the-minute picture of the system, the company is better able to sell more gas.

This system, first of its kind in the country, was designed especially for Mississippi Valley. Used only to read remote meters now, it can be adapted to perform actual control functions at distant points.

• • •

If you'd like to have faster, more efficient communications, call your Bell Telephone representative. He will be glad to study your needs.

BELL TELEPHONE SYSTEM

PRIVATE LINE TELEPHONE • PRIVATE LINE TELETYPEWRITER

CHANNELS FOR: DATA TRANSMISSION • TELEMETERING • REMOTE CONTROL
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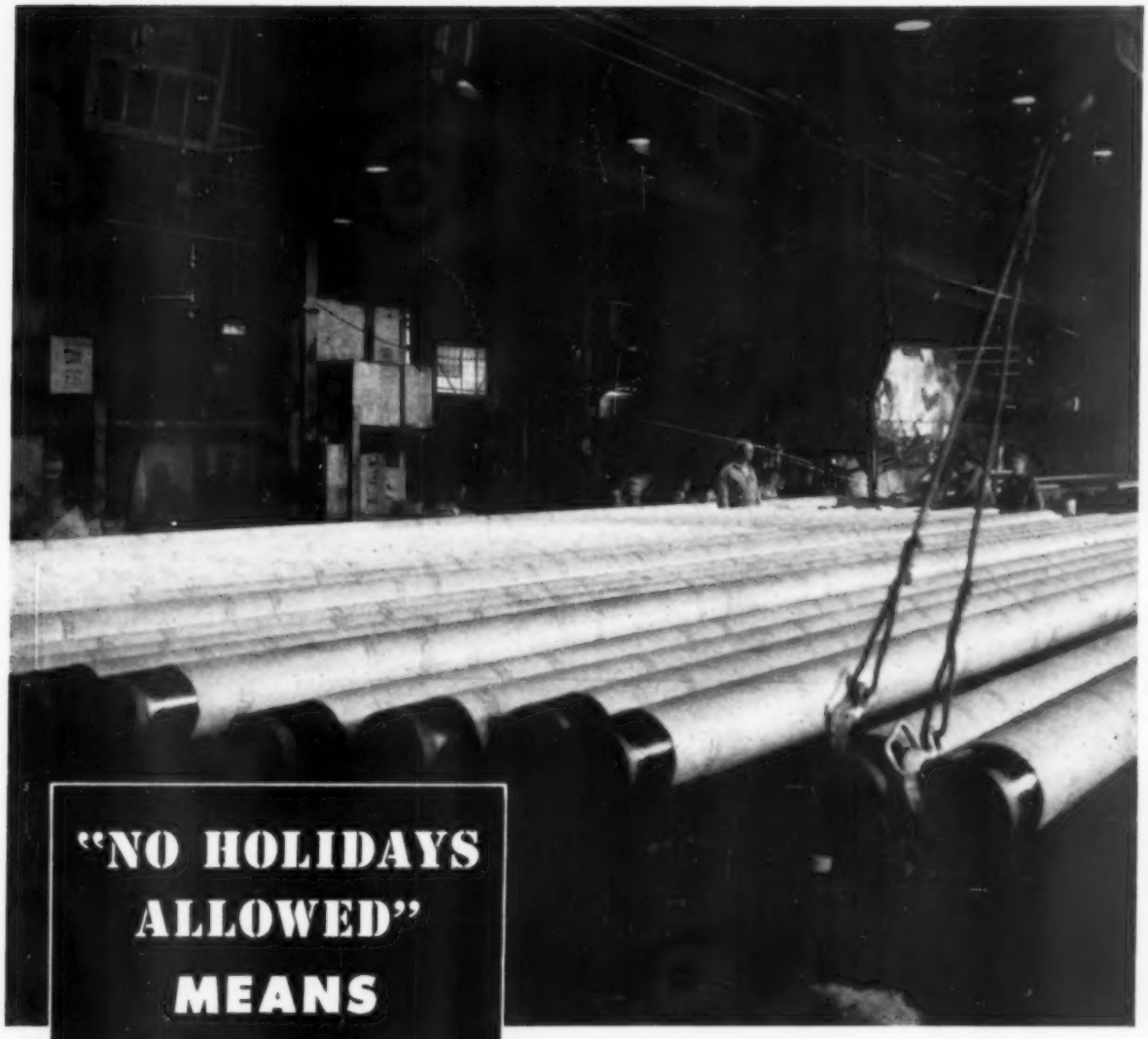

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Another "first" pioneered by the first name in pipe protection

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CORROSION FEATURE

Part 1

Relationship of soil properties to corrosion of metals and methods of reducing losses learned from field exposure program involving 37,000 specimens

RESULTS OF BUREAU OF STANDARDS' 45-Year Corrosion Study

Melvin Romanoff, *Chemist Corrosion Section, Metallurgy Division, National Bureau of Standards*

Abstract

THIS report is a synopsis of the National Bureau of Standards Circular 579, entitled, "Underground Corrosion," which supersedes the 1945 publication. The circular is a record of the extensive investigations on the corrosion of metals in soils that were conducted by the Bureau over a period of 45 years.

The investigation was initiated in 1910 with a study of corrosion caused by stray-current electrolysis and methods of combating it. As corrosion due to stray currents became less important, attention was turned to field burial programs to determine the relationship of various properties of the soils to the corrosion of buried metals and of methods to reduce corrosion losses. During the 30 years of the field exposure programs, data have been obtained on 37,000 specimens representing more than 330 varieties of materials for exposures up to 17 years in 128 test sites that included 95 different types of soils.

Reference is also made to the laboratory investigations conducted at the Bureau regarding the electrical and electrochemical aspects of underground corrosion and to the study of cathodic protection.

Metals, in the form of ores, are usually found in the earth combined with oxygen and other elements. The refined metals usually represent an unstable condition because when placed in the earth they tend to revert, by corrosion, to their original form or to a similar form as found in nature. As a result, the corrosion of metallic structures buried in soils, or in direct contact with soils, has long been a serious engineering and economic problem.

There are in the United States today almost 1,000,000 miles of gas, water, and oil pipe lines, and 170,000 miles of buried communication, signal, and power cable systems, as well as an unknown number of other structures such as tanks, pilings, and burial vaults.

The annual cost to the pipe line industry in this country alone, resulting from the protection and replacement of underground structures due directly to corrosion, has been estimated to be in the order of $600,000,000. In addition, a higher and undeterminable cost results indirectly from corrosion through the loss of products, shutdown of services, and loss of life and property by fire and explosion that may result from leakage due to corrosion. Furthermore, because the corrosion rates are so often unknown, engineers often over-design underground structures by specifying extra thicknesses of metal, which results in needless consumption of large quantities of metals.

Until the early part of the Twentieth Century, the corrosion of metals in soils was attributed exclusively to stray electric currents from external sources, such as direct current powerhouses and electric railways. These electric currents pass through certain sections of underground structures and then enter the earth where conditions are favorable. Severe corrosion occurs at these discharge areas.

The seriousness of underground corrosion was recognized by Congress in 1910, when the National Bureau of Standards was authorized to make a study of corrosion caused by stray electric currents and of methods of combating it. Investigations, both in the field and in the laboratory, were carried on for 10 years, and the results were published in 17 technological papers, which are summarized in the National Bureau of Standards Circular 579.

Field Burial Program Initiated

As a result of the Bureau's studies, methods of controlling stray-current electrolysis were developed to such an extent that corrosion from this cause became relatively unimportant. Another outcome of this investigation was the realization that stray-current electrolysis was not the only cause of underground corrosion, but that serious corrosion occurred under circumstances that excluded stray currents as an explanation. Therefore, in 1922, the Bureau initiated a field burial program to determine the relationship of various properties of the soils to the corrosion of buried metals and to develop methods for reducing corrosion losses.

These investigations were carried on until 1952 when the last of the specimens were removed from the test sites. During the course of the investigations the Bureau had the cooperation of 17 technical organizations and government departments, 103 manufacturers who supplied materials, and 105 utility companies and municipalities who provided test sites and labor. Approximately 37,000 specimens representing more than 330 varieties of materials were exposed to 128 test sites throughout the United States during the 30 years of the field exposure programs.

As a rule, 10 or 12 specimens of each material were buried at each test

site, and two specimens were removed periodically, so that for most materials corrosion data were obtained for exposures up to about 17 years. Figs. 1 and 2 show how the specimens were buried at the test sites. At most of the test sites the specimens were buried as shown in Fig. 2, that is, in a trench dug to hold a single row of specimens. The specimens were placed in the trench in such a way that one complete set of specimens, consisting of two samples of each material, could be removed after a certain period of exposure without disturbing the specimens intended to be buried for longer periods.

To give a general idea of the extent of the burial tests, Fig. 3 shows a complete set of specimens that were removed in 1948, after exposure for periods up to 14 years, from the moderately corrosive Hagerstown loam at Loch Raven, Maryland.

After removal from the test sites, the specimens were returned to the Bureau, where each material was treated by appropriate chemical and mechanical procedures to remove the corrosion products without significant loss in weight or mechanical injury to the uncorroded metal. Measurements of weight loss and pit depth were then made to evaluate the extent of corrosion on the specimens.

Factors That Cause Corrosion

Before discussing the results obtained from the field tests, it is advisable to say something concerning corrosion processes in general, and of the factors that affect the corrosion of metals in soils. Much of this information about soil corrosion was developed during the course of the Bureau's 30-year field burial program.

Most of the corrosion of iron and other metals in soils is the result of an electrochemical reaction. For such a reaction to occur, there must be a potential difference between two points that are electrically connected in the presence of an electrolyte. Under these conditions a current will flow from the anode area through the electrolyte or soil to the cathode and then through the metal to complete the circuit. The anode area becomes corroded through the loss of metal ions to the electrolyte.

Although the electrochemical theory of corrosion is simple and easily understood, correlation of this theory with actual corrosion of metals underground is complicated because of the many factors that determine not only the amount or rate of corrosion, but also the kind of corrosion, and whether it is uniformly distributed over the metal surface or is localized as the pitting type of corrosion. The latter is of major importance in pipe lines or other structures designed to carry liquids or gas. On the other hand, for underground structures that are primarily load-bearing, such as piling, the maximum pit depth is of less interest than the overall loss in weight or strength.

As soils affect the rate of corrosion of metals, knowledge regarding the classification, characteristics, and properties of soils is helpful. Soil is a heterogeneous, porous material that ranges in character from soft spongy peats through soft clays, loams, and silts to the coarse-grained sands and gravels. More factors enter into the corrosion of metals in soils than in other environment, and these various factors are frequently interrelated.

The chief factor in most underground corrosion is the permeability of the soil to oxygen and moisture. This permeability is determined by physical characteristics of the soil such as texture, particle size, particle size distribution, apparent specific gravity, and volume shrinkage when wet soil dries. Permeability is also affected by the amount of water that the soil contains, and, because this amount varies from season to season in most localities, it cannot be expressed in quantitative terms.

Oxygen, either from atmospheric

The Author

Melvin Romanoff, chemist, Corrosion Section, Metallurgy Division, National Bureau of Standards, attended Brooklyn College and George Washington University where he majored in chemistry. Since 1937, with the exception of two years when he served as a field ammunition inspector and renovator in the armed forces, he has been engaged in research in connection with the soil-corrosion investigations at the National Bureau of Standards. Among other projects, he is currently engaged in planning a new field exposure program. He is a member of The National Association of Corrosion Engineers.

FIG. 1. **Corrosion specimens** buried in cinders at Milwaukee ,Wisconsin.

FIG. 2. **Corrosion specimens** buried in Hagerstown loam at Loch Raven, Maryland.

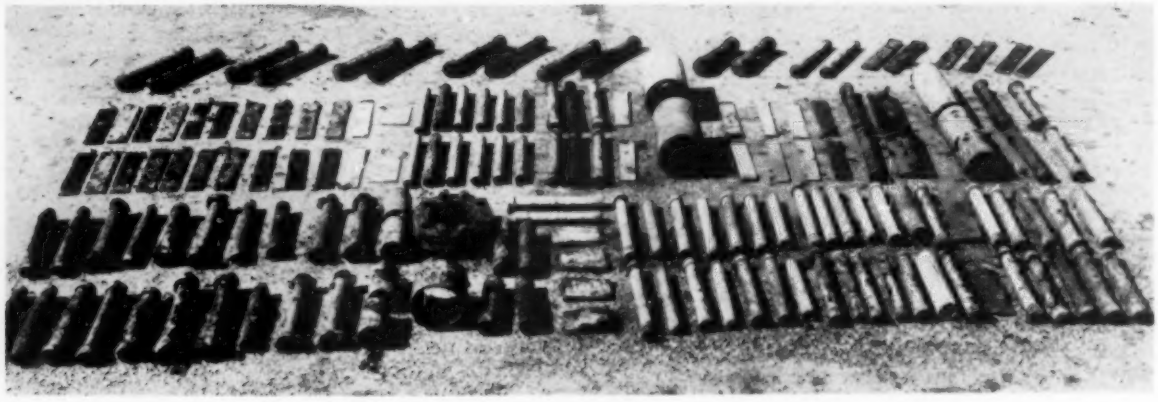

FIG. 3. **Specimens removed** in 1946 from the test site in the moderately corrosive Hagerstown loam at Loch Raven, Maryland.

sources or from oxidizing salts or compounds, stimulates corrosion by combining with metal ions to form oxides, hydroxides, or salts of the metal. If these corrosion products are soluble or are otherwise removed from the anodic areas, corrosion preceeds — but if the corrosion products accumulate they may serve either as a protective coating to reduce corrosion, or to accelerate and localize corrosion when the products are more cathodic than the bare metal.

Local differences in the packing of the soil and in its moisture content may develop oxygen concentration cells, where the area with the least oxygen is more readily accessible. Corrosion by this process of differential aeration is, in effect, a variation of the theory that a continuous oxide film on iron is more noble (or less corrodible) than the iron itself, but if the film is broken, corrosion of the exposed iron is accelerated. Such corrosion may be either general or localized depending upon the relative size of the anodic and cathodic areas.

The principal function of soil moisture in underground corrosion is to provide the electrolyte for the electrochemical corrosion process. The soil electrolyte is composed of hydrogen and hydroxyl ions from the water itself, and a variety of cations and anions that depend upon the soluble salts dissolved from the soil. These ions determine the electrical conductivity or resistivity of the soil, the chemical properties such as acidity and alkalinity, and the chemical reactions between the primary products of corrosion and the electrolyte. For example, iron is corroded by electrolytes that contain high concentrations of sulfates or chlorides because the corrosion products formed at the anode and the cathode are both soluble. On the other hand, the anodic corrosion of lead in the presence of sulfates or chlorides ceases after a short time because of the deposition of insoluble lead salts on the anode surface.

In general, corrosive soils contain large amounts of soluble salts and consequently have relatively high conductivities or low resistivities. On the other hand, the least corrosive soils, as a group, have high resistivity values, which indicate low concentrations of soluble salts. On exploratory surveys, determinations of resistivity provide approximations of the corrosivity of the soils, particularly when supplemented by determinations of the hydrogen-ion concentration or the total acidity of the soil, or both.

The electrical factors that affect corrosion are those that define the size, number, and location of the anodic areas, and the amount of current that flows from the pipe to the soil. Galvanic currents may develop because of contact between dissimilar metals, or because of the presence of strains, inclusions, intermetallic compounds, or separate constituents like graphite in cast-iron, in fact because of any departure from complete homogeneity of structure and composition of the metal. Potential differences as high as 0.9 v have been observed when one portion of a soil in contact with a steel pipe was moist in comparison with an adjacent portion of the soil that was drier and hence more permeable to oxygen. Oxygen concentration cells of this type are frequently found in pipe lines where the water table is at or near the bottom of the pipe, and where, consequently, the bottom areas of the pipe are more severely corroded than the top. Oxygen concentration cells also may develop from stones, sticks, and other foreign material when the trench is backfilled. Potential differences also may be established through the interconnection of different metals, for example, the use of copper service pipe with iron water mains.

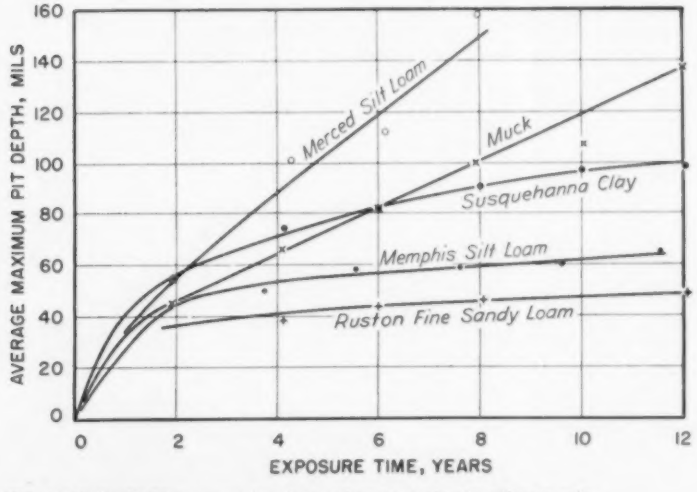

FIG. 4. **Pit depth-time** curves for plain carbon steel pipe in different soils.

The amount of current that flows through the cell, as a result of the potential difference, is influenced by the conductivity of the electrolyte and by polarization at the metal surfaces. The relative size of the anode and cathode is an important factor in determining the amount and kind of corrosion. For a given potential difference, the amount of current that flows through the cell frequently is determined by polarization or passivity of anode or cathode, whichever is smaller. For a given current, anodic corrosion depends upon the size of the anode, i.e., upon the current density.

Another factor is bacteria in the soil, particularly the anaerobic sulfate-reducing bacteria, which convert soluble sulfates in the soil to sulfides. These bacteria are most active in poorly aerated swamp areas where the pH of the soil water is about neutral, and where there are sufficient soluble sulfates and organic matter for bacteria to thrive.

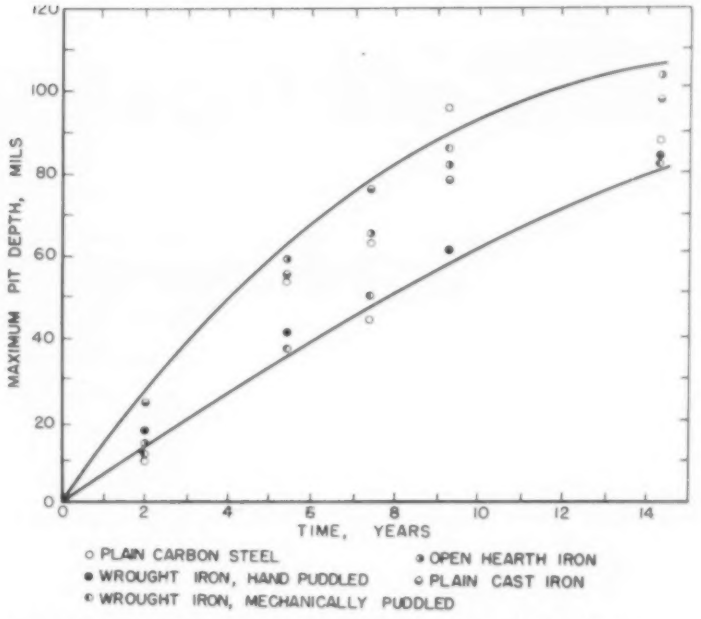

FIG. 5. **Pit depth-time** curves for ferrous pipe specimens buried in Sharkey clay.

95 Types of Soil

The Bureau's 128 test locations represent 95 different types of soils. Selection of the test sites for the several test programs was determined in part by previous knowledge of the corrosive character of that particular soil environment, and in part by availability of the location and facilities of one of the cooperators in the project.

The chemical and physical properties of the soils at the test sites cover a wide range. The reaction of the soils ranges from extreme acidity with a pH of 2.6, to high alkalinity with a pH of 10.2. The resistivity of the soils ranges from 51 ohm-cm, which is approximately that of sea water, to 54,000 ohm-cm, indicating the absence of soluble salts. The chemical properties show that the soils differ widely in the nature and amount of their soluble salts, for example, in one soil the soluble material is almost entirely in the form of chlorides, whereas in another soil the soluble material is almost entirely in the form of sulfates. The soils range from highly oxidizing to definitely reducing environments.

In the first extensive burials, in 1922, specimens of commonly used ferrous pipe materials were buried at 47 test sites. Specimens were removed periodically and results were obtained for exposures up to 12 years in the more corrosive soils, and up to 17 years in the less corrosive soils. In 1928, similar ferrous materials and some copper and copper alloys were buried in a new group of test sites, and about this time, another burial program was started to investigate the behavior of the various types of bituminous coatings that were in use at that time. Additional burials of low and high-alloy irons and steels, copper and copper alloys, zinc, various alloys of lead, lead-coated steel, galvanized iron, tin-coated copper, various types of non-bituminous-organic coatings, and asbestos-cement pipe were made between 1932 and 1941, in 15 test sites.

The plain ferrous pipe materials represented in the field tests were open-hearth iron and steel, hand-puddled and mechanically-puddled wrought iron, Bessemer steel, plain carbon steel, pit cast and centrifugally cast iron.

Data obtained on these materials for periods of exposure up to 17 years show that the initial loss in weight or pitting may be maintained in one soil, whereas in another the rate of corrosion may decrease with time. This is illustrated in Fig. 4, which shows the maximum pit depths plotted against the time of exposure for plain carbon steel in different soils.

In general, in well-drained soils having high resistivities, such as Ruston fine sandy loam and Memphis silt loam, the rate of corrosion may be high initially, but decreases after a few years of exposure to almost complete cessation of pitting. In soils of this type, an increase in wall thickness will result in a substantial increase in the life of the pipe. On the other hand, in poorly drained soils having low resistivities, such as Merced silt loam and muck, the rate of corrosion is nearly constant with time after the first year or two. In soils of this type, it is more practical to apply protective coatings or some other means of protection than to increase the wall thickness.

The curves for weight loss plotted against time in the same soils show that the weight loss is affected in a similar manner. It is also evident from the curves of Fig. 4 that the behavior of a pipe underground cannot be predicted from observations for a single period of exposure.

Other facts brought out by the field exposure tests are that none of the commonly used ferrous metals is immune to corrosion in all of the soils, and that in the same soil these metals corrode at nearly the same rate. This is illustrated in Fig. 5, in which the maximum pit depths on plain carbon steel, wrought-iron manufactured by two different processes, open-hearth iron, and plain cast-iron are plotted against the time of exposure in a poorly drained Sharkey clay soil. It will be noted that if curves for each material were drawn, the result would be a group of curves that cross and recross each other and fall essentially between the two extreme curves shown. This shows that no one material was superior to any of the others and that the different metals corrode at approximately the same rate in the same soil. This is typical of the behavior of the plain ferrous metals in any one environment. Weight loss-time curves for the plain ferrous materials show the same tendencies.

(To Be Continued)

How are Pipelines Behaving

A survey of a number of companies operating pipelines in the Gulf of Mexico shows that in many cases cathodic protection works better in salt water than on land Chief difficulty comes from mechanical damage to protection equipment from action of the sea

Donald M. Taylor
Gulf Coast Editor

THE PIPELINE ENGINEER surveyed eight companies operating lines in the salt water of the Gulf of Mexico and found that coatings in salt water stand up as well or even better than those on land if they are protected cathodically. As a matter of fact, several of the companies reported that current requirements for cathodic protection were less after several years operation than they were at the time the line went into operation. There is evidence that this may be the direct result of calcareous deposits built up at holidays and on exposed sections of the line by the impressed current acting through the sea water.

The two failures reported from corrosion took place on lines not cathodically protected and not buried below the reach of marine predators. In both instances the coating had been penetrated by barnacles and oysters and the failure came after only two years' operation.

Almost all companies reported that calcareous deposits had built up on the platform risers where coating had been damaged in the splash zone. One company reported that this deposit was apparently showing excellent corrosion protection qualities. In one case, the coating on a riser had been completely pounded off the pipe for a distance of six feet below the surface by waterlogged debris lodged between the riser and the platform. The entire section had been plated with a calcareous deposit 3/16-in. thick. When the deposit

DESCRIPTION OF THE LINE				PRELIMINARY SOIL SURVEY	RESISTIVITY OF SOIL	COATING
Nominal size	Wall thickness	Length (miles)	Age			
8-in.	5LX-42 Sch 60	8.4	6 yr 8 mo	Hand cores-gray sandy mud	Approx. sea water 25-30 Ohms cu cm.	Coal tar-2 coats. One coat 1/8 in. with glass fiber, second coat 11/16 in. with outer glass wrap.
10-in.	5LX-42 Sch 40	9.7	3½ yr	Same	Same	Same
6-in.	5LX-42 Sch 40	1.7	1 yr 8 mo	Same	Same	Same
10-in.	5LX-42 Sch 40	1.1	1 yr 8 mo	Same	Same	Same
12-in.	0.375	48.1	2½ yr 1½ yr	Drop type core barrel. Mud, clay, some shell reefs. Water 0-37 ft.	Assumed 20—150 Ohms cu cm.	One coat intermediate pipeline enamel with 0.018-in. glass fiber. Second coat with wrap of 15-lb perforated coal tar impregnated asphalt felt.
10-in.	0.500	9.3	1 yr 8 mo 9 mo	No survey made. Moderately stiff clay.	Same	One coat intermediate pipeline enamel with 0.020 in. glass fiber. Second coat with 15-lb perforated coal tar impregnated asphalt felt.
4-in. 6-in. 8-in. 10-in.	0.1875 0.250 0.219 0.344	7 25 21 49	— — — —	No preliminary surveys made. Most of area was composed of silt.	Assumed sea water.	Coal tar—one coat 1/16 in. with 0.025 -in. glass fiber. Second coat 1/32-in. with 15-lb coal tar saturated asbestos felt with spiral wrap of kraft paper.
6-in. 4-in.	0.250 0.250	14 —	—	No preliminary survey made. Gumbo and unconsolidated soil.	Assumed sea water.	3/32-in. coal tar enamel with glass fiber wrap. Second coat of 3/32-in. enamel with pipeline felt. Final cover kraft paper.
20-in. 16-in. 12-in.	0.344 0.313 0.375 0.313 0.375	9 23 29	—	Survey for soil analysis, buoyancy, and resistivity.	50—200 Ohms/ cu cm.	Two coats enamel, two wraps glass fiber.

in the Gulf

CORROSION FEATURE

Corrosionwise?

was buffed off the pipe, the metal was found to be in excellent condition. There was no evidence of pitting.

Several companies have reported mechanical difficulties in maintaining test leads and electrical cable leads from the pipeline to the anode beds. The leads to the anode beds were damaged by shrimpers dragging nets across the Gulf floor, and wave and current action also has taken an expensive toll. Rigid conduit has supplied the answer in some instances, but, of course, it too must be protected if made of metal.

Marker buoys for test leads have given trouble. The constant wave action frays cables and several companies indicated that pile clusters at the test lead station seem feasible. The conduit for the leads should be rigid and tied into the piling.

Some companies protect the steel platforms right along with the pipelines. In this case the lines are tied into the platforms with no insulation to separate them. Current requirements of the lines are insignificant as compared with the platforms. Other companies separate the two in order to determine better the performance of the cathodic protection of the pipelines.

The accompanying table summarizes the performance of a number of lines laid in the Gulf. Note that only one line requires more current today than when it was originally placed in service.

CONCRETE COATING	LAYING METHOD	CORROSION PROTECTION	PROTECTION HISTORY and EFFECTIVENESS
Specific gravity of line 1.29—no additional weights or weight coating used.	¼ to 1 mi. sections floated on pontoons 3 to 5-ft of cover.	Originally, magnesium anodes on 6-mi centers, check points in between. Initial potential minus 1.15 to minus 1.32 with current drain of 3 to 4.1 amp.	Protection changed because of difficulty of maintaining cable to anode beds. Installed rectifier seaward end with graphite anodes, and carrying entire line with check-point on shore. Potential at rectifier—minus 1.36 with rectifier reading 3.5 volts at 11 amp. Potential on shore minus 1.03 volts.
1¼-in. concrete coating with 1-in., 17. g. galvanized poultry mesh. Sp Gr 1.32.	Stovepiped from barge, 2 to 3-ft cover.	Initial requirements on magnesium anode stations 3 to 3.5 amp with impressed potential of minus 1.15 to minus 1.27 volts.	Converted as above. Now shows seaward potential of minus 1.30 with rectifier reading of 4.5 volts at 14 amp. Shoreward potential minus 1.18 volts.
Same as above	Same as above	Carried by rectifiers on platform.	Potential minus 1.18 volts.
Same as above.	Same as above.	Same as above .	Potential minus 1.28 volts.
Approx. 47.7 mi. concrete coated. Concrete 1½-in. 3000 psi at 7 days. Galvanized 1½-mesh reinforced. Field moulds on barge.	Stovedpiped from barge. 3 ft min. cover.	Protected by rectifier installation. 25 mi section near shore required 116 amp. Line between platforms (23 mi) required 142 amp.	Included in protection are bare steel platforms Shoreward installation still 116 amp. Between platforms now dropped to 110 amp. Calcareous deposit in splash zones.
Same as above	Same as above	Protected by rectifier installation along with steel platforms. Original requirements 135 amp.	Original current requirements are the same: 135 amp. Calcareous deposits in evidence at water line.
No concrete coating or weights.	Stovepiped from barge. Approx. 4-ft cover.	Protected by magnesium anodes. Pipe-to-soil potentials made during laying operations and magnesium anodes installed from lay barge.	Test leads were not provided and it is difficult to study protection job. Company recommends test leads on piling clusters every 3 miles.
Only one short section has concrete coating or weights.	Part laid with pontoons. Remainder laid from barge.	Lines are tied-in electrically to various steel platforms, which have higher current requirements than pipe. Use both rectifiers and magnesium for protection.	Where coatings damaged in splash zone, calcareous deposits built up.
2½-in. concrete coating, Sp gr 1.40.	Stovepiped from barge, 3-ft cover.	14 magnesium anode stations on 61.5 mi of pipe. Spacing 2, 4, 6 mi apart, test leads in between. Also use rectifiers.	Original current requirements 0.0176ma/sq ft. Requirements today—0.0204 ma/sq ft.

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CORROSION FEATURE

George B. McComb, long identified with the field of pipeline protection, has been commissioned by industry members to assemble a collection of articles on protection methods, for use as reference material by engineers, operators, and managment. These articles will be written by many authors. Heretofore unpublished material will appear in *The Pipeline Engineer*. These eventually will be combined with selected material previously published and issued in several "Bound Collections."

This is the first of the articles.

ECONOMICS AND EFFECTIVENESS OF

Cathodic Protection On Large Diameter Pipelines

N. K. Senatoroff

Southern Counties Gas Company
Los Angeles, California

N. K. Senatoroff

WHAT EITHER cathodic protection or pipeline wrapping alone might fail to accomplish in protecting a pipeline from corrosion, a combination of both might do. This, the author's thesis, is exemplified in a report on the experience of one of California's natural gas transmission company's effort to stop corrosion in a 26-in. high pressure line in San Joaquin County.

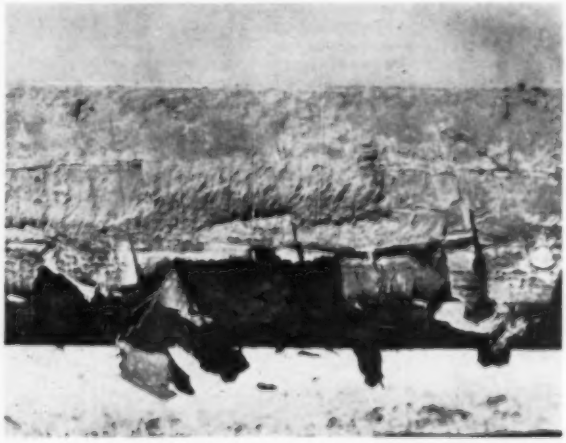
IN 1941, the line, then 10 years old, was leaking to such an extent that a study was undertaken to find a means of reducing repair costs sufficiently to keep the line in operation for several more years. Drainage stations were decided upon as an experiment, and the first one was installed in October of that year, with the second being erected in January, 1943. Studies were made of the results, which was found not to be up to expectations, because the electrolytic corrosion damage to the line prior to the installation of cathodic protection had been so extensive that there existed numerous pits in the pipe, which had actually perforated the pipe wall. So reconditioning of the pipe was decided upon, with considerable emphasis being placed upon the thickness of the protective material used. The results to date are reported in this article.

Although the effectiveness of applying electrical drainage to pipelines, resulting in almost complete cessation of metallic corrosion, had been known and universally accepted for many years by the engineers of the gas, oil, and water industries, occasionally even today serious differences of opinion arise among them during discussions involving selection of the most effective, and at the same time the most economical, method of corrosion mitigation for new lines, or for lines proposed for reconditioning.

Some engineers favor first-class protective coatings consisting of coal-tar enamels, shielded with asbestos wrapper, and the very minimum of cathodic protection to reinforce the effectiveness of protection rendered by the coating, whereas others are recommending laying the lines bare with an idea of applying electrical drainage as required.

Both of the two schools of thought have been, on numerous occasions, described in technical literature as successful and economically sound applications of their respective methods to pipelines, and thus have contributed to the general knowledge of corrosion control by offering at least an alternate choice in selecting the most suitable method of corrosion mitigation of the proposed project.

Occasionally in analyzing the possibility of applying these



Condition of asphalt and felt coating as pipe was removed from ditch, before cleaning and reconditioning.

methods of corrosion protection to the job on hand, special cases may arise that present a rather intriguing opportunity for "straddling the fence" between the two methods. Because of purely local conditions, it might happen that neither of the methods conveniently fitted the proposed job.

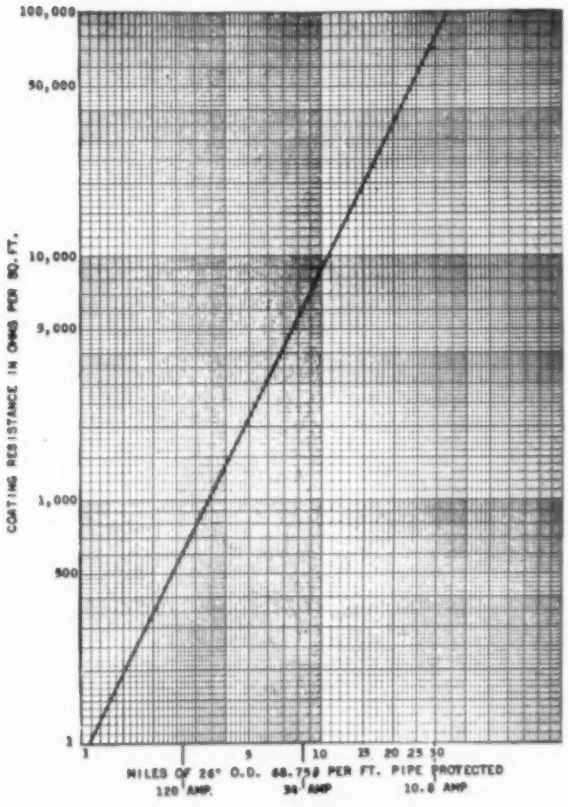
San Joaquin Valley Line

It is the purpose of this report to discuss the preliminary study of the costs of corrosion protection as applied to the proposed reconditioning of a section of 26-in. OD high pressure natural gas transmission line in San Joaquin Valley, California.

The line in question was an all welded pipeline, ¼-in. wall, weighing 68.75 lb per linear ft, approximately 70 miles — one half reconditioned in 1944 and the balance in 1945, which had been wrapped with asphalt coating and asbestos wrapper. The coating job had been carefully inspected and applied in accordance with what were then the best known methods of coating technique.

By 1941 the leak repair costs in this section of the line had reached such a figure that a job study was undertaken to determine whether a reconditioning program was in order, or whether the application of electrical drainage, at reasonable cost, would enable the operating department to keep the pipeline in service for a few more years.

In this case we were fortunate to find sufficiently accurate records of leaks and maintenance costs for several years back, which assisted us in the analysis of not only the frequency and location of the leaks, but also in evaluation of the leak repair costs.



Rectifier capacity vs coating resistance.

Typical Installation

Based on the study of these records it was decided to install a few drainage stations at the most corrosive locations on the line and observe their effectiveness by periodic potential surveys of the line and by perusal of leak repair records.

The actual location of the stations, their output capacities, and their spacing were, of course, not necessarily in accord with the best theoretical design requirements as given in the accompanying chart of "Rectifier Capacity vs Coating Resistance," because of their dependence on such factors as availability of rights-of-way, proximity of other underground structures, etc., but on the whole they were in conformity with the average station location requirements.

The first station, 85-1, of gas-driven generator type, of 5-kw capacity and 10 to 40 v with maximum 150 amp output, was installed in October, 1941. The second, 85-2, similar type station had been put into service January, 1943.

After placing of these two cathodic protection stations, it was found that electrical drainage did not reduce the frequency of leak repairs as was expected and that the number of leaks per mile per year remained at a more or less constant figure.

Examination of the pipe and the study of metal loss of corrosion control coupons revealed that the cathodic protection was effective so far as present day corrosive action of soil was concerned; however, the electrolytic damage to the pipe prior to the installation of cathodic protection had been so extensive that there existed innumerable pits in the pipe, which had actually perforated the pipe wall and were undetected only because of the minuteness of gas leaks. Later on, of course, these leaks increased in volume and continued to show up.

Leakage repair costs remained high even after cathodic protection had been applied. Undoubtedly after a period of

Sandblasting after asphalt coating and wrapping was removed. A conventional traveling type cleaning machine equipped with special cutting knives was used.

Pipe cleaned and ready for pit welding.

After removal of the old asphalt coating some field sandblasting was required before depth of pits could be measured. Here pits are welded.

years the frequency of leaks per mile per year would have decreased; however, the importance of uninterrupted and continued operation of this line made it imperative that leakage be eliminated as soon as possible.

Therefore, in the summer of 1944, the management had decided to recondition this section of the line by welding up individual pits exceeding in depth one-half of the pipe wall, replacing portions of it that had corroded beyond the reconditioning stage, and recoating the line with coal-tar enamel, asbestos wrapped. It was also decided to retain and operate cathodic protection stations after reconditioning of the line.

In the course of preliminary discussion of coating specifications, the question of the allowable minimum thickness of enamel was brought up. Since at the outset of the reconditioning program it was decided, as far as pipe protection was concerned, to reinforce the coating performance with supplementary drainage, a group of engineers questioned the need of additional expenditures for an extra 1/32-in. thickness of enamel in order to obtain a minimum of 3/32 in. and an average 4/32-in. enamel coat if the 2/32-in. minimum and an average of 3/32-in. thickness would suffice. This was with the understanding, of course, that all "holidays" in the coating would be repaired before final backfill and the entire coating job would be rigidly inspected.

Thicker Enamel Favored

As coating application on the reconditioned portions of the line was to be performed by a traveling type machine over the trench (and this method of application had never been tried up until then on this size of pipe in Southern California) the group of engineers favoring the heavier enamel thickness of the protective coating requested from the manufacturer of the coating material information regarding field experiences with similar equipment elsewhere on large diameter pipelines. The manufacturer, describing the findings of engineers on the Tennessee Gas Transmission Company's line, replied as follows:

"Where coating is 3/32 in. plus, the only holidays the detector is picking up is where the machine starts and stops at the welds where the sections are joined or where the coating shoe drags (when out of adjustment). Field inspection of 4400 ft of pipe coated in one day showed that holidays, aside from where coated pipe rested on skids, were less than 10 to 1000 ft of pipe coated.

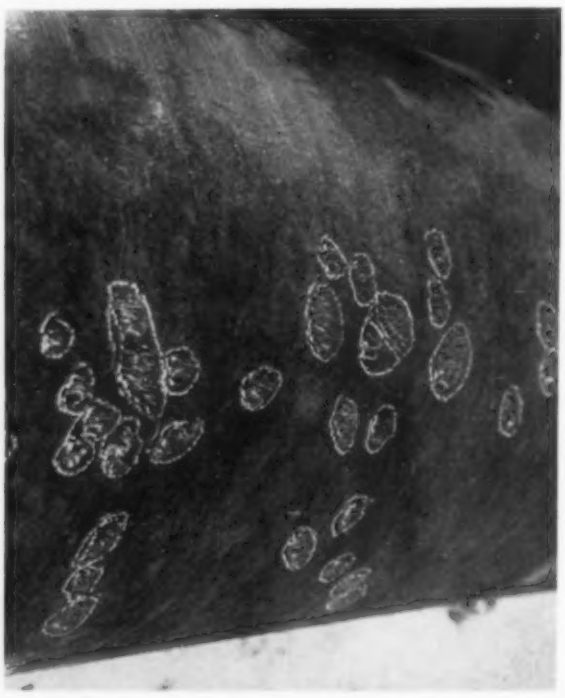
TABLE 1—Cathodic Protection — Cost & Operating Data.
Before and After Reconditioning.

Unit No.	Current Amp	Miles Protected	Pipe Size	Investment	Annual Maintenance and Operating Costs	Remarks
85-1	90	4.4	26"	$5984.48	$370.78	Before reconditioning
85-1	25	8.5	26"	$5984.48	370.78*	After reconditioning

*Less difference of fuel cost to operate station at 25 as against 90 amp output.

TABLE 2—Cathodic Protection — Cost & Operating Data.
After Reconditioning.

Unit No.	Current Amp	Miles Protected	Pipe Size	Investment	Annual Maintenance and Operating Costs	Remarks
85-8	30	22.4	26"	$4000.00	$181.00	1956 Costs after Reconditioning



Condition of pipe after cleaning and pit welding, but prior to priming and application of the coal-tar enamel and asbestos felt.

Double coating and wrapping consisted of a 3/32-in. minimum thickness of enamel, plus a 15-lb asbestos felt wrap, plus a 2/32-in. minimum thickness of enamel, plus 60-lb kraft paper. The last reduced the temperature of the pipe for lowering-in; where this work was done the desert temperature was 125 F up.

The pipeline reconditioned in 1944 being lowered-in.

"Inspection of 3600 ft of pipe with 3/32-in. average thickness of enamel, aside from the skid marks, where coated pipe rested on skids, average 60 to 1000 ft of pipe coated.

"The required extra patching on pipe enameled with average thickness 3/32 in. (2/32 in. plus) enamel coating machine applied is estimated at several times the cost of the extra enamel required for a minimum thickness of 3/32 in. (3/32 in. plus)."

These statements, forthcoming from the enamel manufacturer, were accepted with natural reservations and brought additional study involving 2/32 in. vs 3/32-in. minimum coating costs.

In order to check the recommendations of the manufacturer, coating application costs on a similar job were examined.

Based on 1956 costs, which are approximately 50.9 percent higher than when this reconditioning program was started in 1944, application of the coating amounts to $4249.92 per mile. This figure includes labor, contractor's overhead, and profit and equipment, but does not include coating and wrapping materials.

Coating material requirements and their costs based on current market prices, and not including material incidental to coating repair, patching of holidays, or skid marks and other unavoidable losses, were estimated as follows on per mile basis:

Amount and cost of pipeline enamel for 3/32-in. uniform coating thickness — 12.08 tons per mile; cost of enamel as of today per mile at $67.87 per ton = $819.87 . . . 1/32 in. ± variation in the coating thickness amounts to one-third of $819.87 or $273.29 per mile of pipeline.

Amount and cost of pipeline primer is equal to 76 gal per mile; cost per mile at $1.16 per gal = $88.16.

Amount and cost of asbestos wrapper is equal to 390 squares per mile. At $2.10 per square its cost per mile equals $819.00.

Total cost of material per mile is $819.87 plus

$88.16 plus $819.00 =	$1727.03
Total application cost per mile	4249.92
Protective coating cost per mile	$5976.95

Thus 1/32-in. coating thickness variation amounts to only $\frac{\$273.29 \times 100\%}{\$5976.95}$ or 4.6 percent.

From the cost study given above of coating material involved in providing an additional 1/32-in. thickness of enamel to the 3/32-in. average thickness, often specified as satisfactory coating requirements, it is quite apparent that the extra cost is fully justifiable, provided the increment of enamel thickness determines the differences between the first-class coating job and an average quality job.

An expediture of approximately $273.29 per mile on the 26-in. line for the improvement of the protective value of the coating is being gradually refunded from the day the line was put back into service, as is apparent from Table 1, which summarizes the original testing cost and operating data of the cathodic protection station, 85-1.

Table 1 illustrates the difference in cost for cathodic protection, before and after reconditioning; using the same test gas-driven generators for a short period of time before replacing with rectifiers, after reconditioning.

After reconditioning the cost to operate is approximately $8 per year per mile for electrical protection. Stated another way, the cost of the rectifier operation amounts to approximately $6 per amp per year for the 22.4 miles, or 27 cents per amp per year per mile.

The return on investment appears in the extension of the miles of pipe protected by electrical drainage from 4.4 miles to 8.5 miles and also in marked decrease from 90 to 25 amp of the station output requirements.

As the life of the "grounds" is directly related to the amperage output of the station, the rate of depreciation of the capital invested in the grounds shall likewise be diminished.

The large and expensive gas-driven generators have been replaced with rectifiers wherever possible at a less capital expenditure amounting to approximately $4000, with the result that the cost of electrical protection has been reduced. At one of the rectifier stations on the reconditioned pipe the cost has been reduced to less than $20 per mile per year.

Table 2 illustrates the economical use of cathodic protection with coal-tar enamels that have a high electrical insulation value. Twelve years after reconditioning the cost to provide cathodic protection justifies the engineers' decision.

There has been no attempt to show the increase in gas revenues from the reconditioned line, a major factor in considering such a program. The line now is capable of carrying a greater volume than before this program was completed.

We are pleased to announce an important new series . . .

The FUNDAMENTALS of Oil and Gas Pipelining

P 605.

THE *Pipeline Engineer* is beginning a new series under the general heading Fundamentals of Oil and Gas Pipelining. It will be a comprehensive practical handbook on basic pipeline practices. Construction, engineering techniques, maintenance programs, operating methods, are but a few of the many important segments of our industry that will be covered.

This fundamental series will be written by outstanding pipeliners of the nation, authorities in their various fields. The salient purpose is to bring to you the most competent handbook on the fundamentals of pipelining that has ever been published.

It will not be a primer solely for beginners. Style of writing will be slanted to refresh the experienced man as well as train the new man. Articles in this series undoubtedly will be useful to the foreman, superintendent, engineer, as well as management. We recommend to our readers that these articles be cut out and filed for permanent reference.

The undertaking is great because the subject is almost as broad as pipelines are long. In a comparatively short span of time pipelining has grown from a somewhat simple operation to a highly technical and complicated one.

In a manner of speaking, pipelining just grew. Welders found out how to drag a rod on a stringer bead and float the captured flux out of the weld on the hot pass. This is but a portion of the best welding technique in the world, and today there are only a few thousand of these "metallurgists" in the U. S.

Pipeline contractors learned on the job, too. Time was when the only instructions a contractor received were, "Start here, and go that-a-way!" But through trial, error, and mistakes, the contractor learned a bag of tricks that is his stock in trade and ended up perfecting an organizational technique that is downright fantastic, and not even rivaled by the armed services or the traveling circus.

Corrosion was costing the U. S. about $5 billion a year when a group of pipeliners from Houston, Texas, decided to change things. They organized and through their companies they financed the National Association of Corrosion Engineers. As a result, corrosion virtually has been halted in the pipeline industry, and thanks to the pipeliners everything from airplanes to steel mills are receiving protection from the world's most destructive force — corrosion.

There was a time when natural gas — one of the most convenient and usable fuels — was a glut on the market. It sold for as little as 2 cents a thousand cubic feet. You could drive from one end of the Texas Gulf Coast to the other at night and hardly ever be out of sight of flares. But men of vision in the pipeline industry stepped in and today almost everyone in America benefits from natural gas.

These are but a few of the accomplishments of the pipeliners. Everytime a new line is laid, pipeliners find some new way of improvising to overcome a difficult obstacle.

Yet the only trouble is that not all of these accomplishments and techniques have been collected into a single book or series. Too much of the information has simply been passed on by word of mouth. This is why *The Pipeline Engineer* takes such pride in starting a series that eventually will cover every single phase of the pipeline industry.

Following is a preliminary ouline of the series:

Crude and Products Lines

1. **History**
   - a. Early pipelines
   - b. Growth and economic factors affecting pipelines — comparison with costs of other transportation
   - c. Year-by-year report of technical developments — welding, etc.
   - d. Statistics — miles of lines, dollars of investments
   - e. Future outlook — increasing per capita use of energy coupled with increasing population
   - f. Pipelining in other fields

2. **Economics**
   - a. Types of corporate structures — independently owned lines, etc.

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b. Laws affecting their operation and Consent Decree, etc.
c. Sources of revenue, limit of earnings and distribution of operating costs
d. Organization of a company — integrated, independent and jointly owned
e. Financing

3. Main Line Design
a. Economic factors — reserves, sales, distances, etc. Cost of lines and stations
b. Economic spacing of pump stations vs line size and wall thickness
c. Flow calculations
d. Calculating power requirements for pump stations
e. Estimating costs of construction
f. Estimating costs of operation

4. Gathering System Design
a. Economic factors — reserves, field extensions, rate of production, etc.
b. Estimating line sizes
c. Flow calculations
d. Calculating pumping equipment
e. Estimating costs of design and construction
f. Estimating costs of operation
g. Planning for future expansion

5. Pump Station Design
a. Sizing pumping equipment
b. Prime movers and design considerations — foundations, auxiliaries, power, etc.
c. Buildings
d. Yard piping and equipment
e. Safety features
f. Controls
g. Estimating construction costs
h. Estimating operating costs
i. Remote controls and unattended operations

6. Tank Systems
a. Kinds of tanks
b. Sizing tanks
c. Closed system operation
d. Tank spacing, fire walls, etc.
e. Losses and vapor recovery systems — preventing losses (microballoons, etc.)
f. Painting and the effect on losses
g. Tank specifications
h. BS&W and mixers
i. Safety features
j. Design considerations, pads, rings, fills, leveling
k. Accessories
l. Outloading
m. Booster pumps, sumps
n. Evaporation and tank losses

7. Controls
a. General description of closed system needs
b. Sizing pump station discharge valves
c. Conventional station controls —electrical, reciprocating power
d. Interface controls
e. Sampling devices
f. Shutdown controls, protective controls, sequence controls
g. Automatic control systems

8. Metering and Gaging
a. Types of meters
b. Methods of gaging
c. Accuracy of metering vs gaging
d. Proving meters—prover tanks, measured mile, etc.
e. Automatic custody transfer

9. Communications
a. Status of the industry today — company owned vs service companies
b. Telephone
c. Telegraph
d. Radio — microwave, VHF
e. Operating costs — company owned and leased facilities
f. Reliability factors of various systems — outages, etc.

10. External Corrosion Protection
a. Causes of external corrosion
b. Cost of corrosion
c. Different kinds of corrosion and causes
d. Pipe coatings and their fundamental purposes
e. Economics of coating and cathodic protection
f. Corrosion surveys
g. Choosing a coating
h. How to estimate the cost of cathodic protection
i. How to estimate the cost of coatings
j. Power sources for cathodic protection
k. Unusual corrosion problems and foreign lines
l. Protection of undersea lines

11. Internal Corrosion Protection
a. Causes of internal corrosion
b. Principles of mitigation
c. Internal line coatings
d. Inhibitors
e. Protection of pipe in storage
f. Cost of internal corrosion

12. Filtering
a. What filtering does
b. Methods of filtering
c. Costs of filtering

13. Maintenance of Main Lines
a. Maintenance forces — organization, size, equipment, etc.
b. Maintenance requirements — right-of-way, condition of line, hazards
c. Patrols and inspection
d. Detection of small leaks
e. Cultivation and preservation of right-of-way
f. Control of erosion
g. Preventive maintenance on land
h. Preventive maintenance on river crossings

i. Line repairs
j. Blowouts
k. Emergency repairs
l. Reconditioning a line
m. Lowering and relocating lines
n. Salvaging lines
o. Maintenance records and costs

14. Cleaning Pipelines
a. Scrapers — kinds of scrapers and purpose
b. Launching equipment
c. Receiving equipment
d. Methods of handling scrapers
e. Cutting costs on pigging lines

15. Scheduling and Dispatching
a. Allocating pipeline space
b. Setting up pumping and delivery schedules
c. Rules for batch or tender scheduling
d. Handling shipping information
e. Equipment for dispatching
f. Accounting for losses
g. Accounting for purchases or tenders
h. Batch separation and disposal of commingled products
i. Calculating movements

16. Operating Pump Stations
a. Organization and duties of personnel
b. Records, common streams, batches, line balance, proving meters, gaging
c. Safety practices, start-up, operations, shutdown, emergencies (plans, etc.)

17. Maintenance of Pump Stations
a. Organization and duties of personnel
b. Preventive maintenance, determining need, scheduling repairs
c. Maintenance of prime movers — electric motors, engines, turbines
d. Control equipment — testing, repairing
e. Meters
f. Valves and equipment
g. Frequency of repairs
h. Pump repairs-seals, impellers, etc.
i. Lubricating schedule
j. Painting
k. Maintenance of tanks
l. Safety practices, emergency repairs
m. Station corrosion
n. Repair reports
o. Control of materials, warehouse, inventory control, and accounting
p. Maintenance of unattended stations

Natural Gas Transmission Lines

1. History
a. Early pipelines
b. Growth rate of pipelines
c. Economics of natural gas
d. Year-by-year history of technical developments
e. Statistics — miles of lines, etc.
f. Future outlook
g. Facts about gas transmission lines

2. Economics
a. Organization of gas transmission companies
b. Laws affecting their operation
c. Corporate structure
d. Gas company accounting, rate base, etc.
e. Financing

3. Main Line Design
a. Committed reserves
b. Contractual commitments
c. FPC approval
d. Station spacing vs line size — calculations
e. Estimating costs of construction
f. Estimating costs of operation
g. Other design factors — temperature of gas, blowdown equipment and sizes, safety valves, etc.
h. Planning for future expansion.

4. Gathering System Design
a. Estimating line sizes
b. Field booster stations power vs line sizes
c. Planning for future expansion

5. Dehydration
a. Purpose of dehydration
b. What is satisfactory dehydration
c. Methods of testing dew point of gas
d. Three methods of dehydration. How each system works
e. How to calculate sizes of dehydration units

6. Gas Scrubbers
a. Methods of scrubbing
b. Estimating sizes of scrubbers needed
c. Piping the scrubbers
d. Estimating costs of scrubbers

7. Hydrogen Sulfide Removal
a. Why hydrogen sulfide must be removed
b. Dangers of hydrogen sulfide
c. How hydrogen sulfide is removed from gas
d. Disposal of hydrogen sulfide — flaring and sulfur plant — economics
e. Notes on embrittlement

8. Removal of Carbon Dioxide
a. How it is removed from gas
b. Estimating cost of carbon dioxide removal

9. Chemicals in Natural Gas and Their Uses
a. Components of natural gas
b. Relative values
c. Properties and behavior of components of natural gas
d. Btu and chemical values of gas

10. Compressor Station Design
a. Sizing power needs

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b. Foundation design
c. Buildings
d. Auxiliaries, power, cooling, pumping economies
e. Yard piping
f. Safety features, shutdowns, etc.
g. Controls
h. Estimating construction costs
i. Estimating operating costs
j. Unattended operations

11. Compressor Station Corrosion
a. Causes
b. Prevention
c. Remedial measures

12. Dispatching
a. What the dispatcher does
b. Effect of weather on dispatching
c. How loss of station or loop affects throughput
d. Efficient dispatching—accounting for gas deliveries and losses

13. Metering and Instrumentation
a. Types and kinds of meters
b. How to size a meter run
c. How to take samples
d. How to determine dew points
e. Instrument repairs and maintenance (conventional instruments)

14. Automatic Controls
a. For purchase meter stations
b. For sales meter stations
c. For remote operations of compressor stations (field or main line)
d. Various systems of controls

15. Operating Compressor Stations
a. Organization and duties of personnel
b. Reporting and records
c. Common sense operation
d. Housekeeping
e. Safety practices

16. Maintenance of Compressor Stations
a. Organization and duties of personnel
b. Preventive maintenance — records, symptoms, etc.
c. Maintenance of prime movers — motors, engines, gas turbines
d. Scheduling maintenance
e. Maintenance of electrical equipment
f. Maintenance of compressors
g. Maintenance of cooling towers
h. Painting
i. Repair reports

Construction and Engineering

1. Right-of-Way
a. Preliminary survey
b. Line location
c. Aerial reconnaisance and surveying
d. Purchasing right-of-way
e. Damage claims — estimating damages

2. Specifications for Construction
a. Drawings
b. Drawing up contracts and specifications
c. Provisions
d. Selecting a contractor

3. Constructing the Line
a. Clearing, grading right-of-way
b. Ditching
c. Stringing
d. Bending
e. Line-up and stringer bead
f. Welding
g. Coating and wrapping
h. Lowering in
i. Testing
j. Backfill and clean-up

4. River Crossings
a. Methods
b. Causes of river crossing failures
c. Laying
d. Ditching, welding, backfilling, etc.

5. Aerial Crossings
a. Design of unsupported spans
b. Pulsation dampening
c. Wind loads, etc.

6. Offshore Pipelining
a. Methods
b. Advantages
c. Special considerations

7. Practical Field Inspection
a. Ditching
b. Welding
c. Lowering-in
d. Coating
e. Backfill and clean-up

8. Methods of Testing Pipelines
a. Air
b. Water
c. Gas

9. Cleaning Pipelines
a. Pigging, blowing, etc.

Miscellaneous

1. Glossary of terms
2. Company relations
   a. Public
   b. Landowners
   c. Press
3. Control of materials, warehouse, inventory, etc.

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In the lobby of the Boca Raton Hotel: Francis Fabick, John Fabick Tractor Co.; Ken Owen, Parkhill Truck Co.; Ray Smith, retired; I. C. Little; Bill Haas, Northern Natural Gas Co.; Ted Murrey, Midwestern Manufacturing, Inc.

Snapped in hotel hallway on way to luncheon: Mr. and Mrs. Lloyd Lippincott, Mrs. M. C. Harter, and Mrs. Harry L. Stallard, all of H & M Pipe Beveling Co.

Pipeline Pictorial

Informal shots taken at Pipe Line Contractors Association meeting in Boca Raton, Florida

A. L. Crumback, Cessco; Jack Scott, Crutcher-Rolfs-Cummings; Ike Ashburn, A.P.V. Co.; J. R. Scribner, Dalyrymple Equipment Co.

Happy to have their picture taken: W. C. McGee, Jr., Tennessee Gas Transmission Co., and Ed Mahoney, Bechtel Corporation.

In serious discussion: Phil Gregory, Houston Contracting Co., and T. A. Hester, Oklahoma Contracting Co.

A "big three" (well, Sammy isn't so tall): Bob Conyes, Conyes Construction Corp.; Steve Bechtel, Jr., Bechtel Corp.; Sammy Collins, Collins Construction Co.

Relaxing before lunch: Paul Payne, Dearborn Chemical, and Paul White, M. E. White & Co.

What UNION CENTRALIZED TRANSPORT CONTROL can do for you

UNION Centralized Transport Control can give you reliable remote control, indications, and systems monitoring for your entire pipeline from one central dispatching office. In effect, it permits the dispatcher to function as if he were actually present at each station under his control.

UNION Centralized Control Systems Now in Pipeline Service Provide:

1. Remote control of pumps and valves.
2. Indications of conditions of pumps and valves.
3. Co-ordinated control of valves determining stream destination at line-switching center in the system.
4. Injection pump control and indication and metering.
5. Booster pump control and indication and metering; also data handling.
6. On-the-line internal combustion engine driven gas compressor station control and indication, including the remote control of governor set point and data handling.
7. Telemetering to indicate and record interface arrival at the switching center.
8. Indications of alarm conditions and automatic shutdown of units caused by faults, with provision for remote reset when consistent with power section operation.
9. Automatic sequencing of valve and pump functions.
10. Digital telemetering of pressures and flow transmitted by protected code. Telemetering may be initiated by (a) rapid upset (b) accumulated deviation (c) clock programing (d) on demand.
11. Automatic logging of telemetered data by system-programed typewriter.

UNION Systems are extremely flexible and can be easily modified to meet changing system requirements. Operation is simple, and above all, reliable.

UNION Systems are readily adaptable to any means of communications transmission, including telephone circuits, carrier circuits, VHF and UHF radio and microwave or private wire.

UNION Centralized Transport Control can be used on a variety of pipeline layouts, gathering systems, tank farms and off-shore applications. It has been thoroughly proved in service, and is backed up by our experience in centralized control, covering more than 25,000 miles of long haul transportation. Write for information on your single or multiple station control requirements.

See our exhibit at the P.I.E.A.—P.E.S.A. Show, Houston, Texas, April 16-18.

GENERAL APPARATUS SALES

UNION SWITCH & SIGNAL

DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY

PITTSBURGH 18, PENNSYLVANIA

Enjoying a story or perhaps a bit of good news: Mike Curran, M. J. Crose Mfg. Co.; Dick Gump, executive secretary of PLCA; Hal Price, H. C. Price Co.

Ray O'Connell, Oklahoma Pipe Construction; Mitchell Deane, Browning-Ferris; Harry Broadwell, International Harvester; Bob Adams, Bucyrus Erie; Russ Burns, International Harvester.

They chose a beautiful setting for this rendezvous: Steve Day, S. D. Day Co.; J. T. Tierney and R. C. Kenan, Koppers Company; Curly Brouillette, Tapecoat; Pat Kelly, Mavor-Kelly.

Bill Swinerton, Engineers Limited Pipeline; W. J. Hodges and Howard Segool, Kendall Co., Polyken Sales Division; R. V. Wilson, Engineers Limited Pipeline.

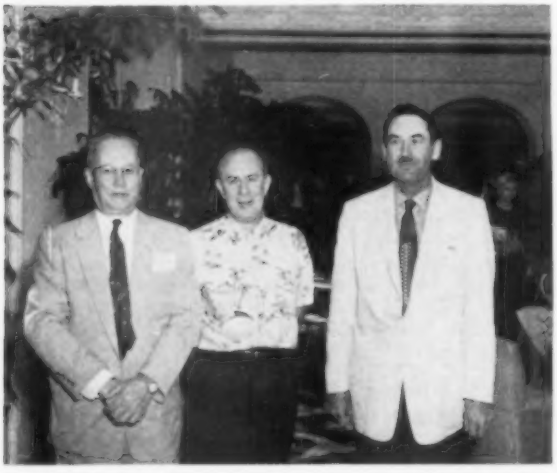
Dick Launder, H. & L. Tooth Co.; Mickey Finn, Jetco; Bill Cook, Engineers Limited Pipeline; Gene Drysdale, H. & L. Tooth.

Bill Haas (left) Northern Natural Gas Co., is outnumbered by manufacturing and contracting people and seems pleased about it. Next to him is Horace Mosteller, White Motor Co., then Ken Owen, Parkhill Truck Co., and Hy Cox, Caterpillar Tractor Co.

Those two interesting couples from Montebello, California, representing H. & L. Tooth Co.: Mr. and Mrs. Gene Drysdale (left) and Mr. and Mrs. Dick Launder.

Well represented was Kendall Co., Polyken Sales Division. Some of the crew are shown here with Sam Snead, the golfing pro. Bill Flaherty (left), Howard Segool, Snead, W. J. Hodges, and John McGivern.

E. B. Hill, Koehring Co. (right) is in good company. Jim Fulghum, Fulghum Contracting (center) and Earl Allen, Associated Pipe Line Contractors.

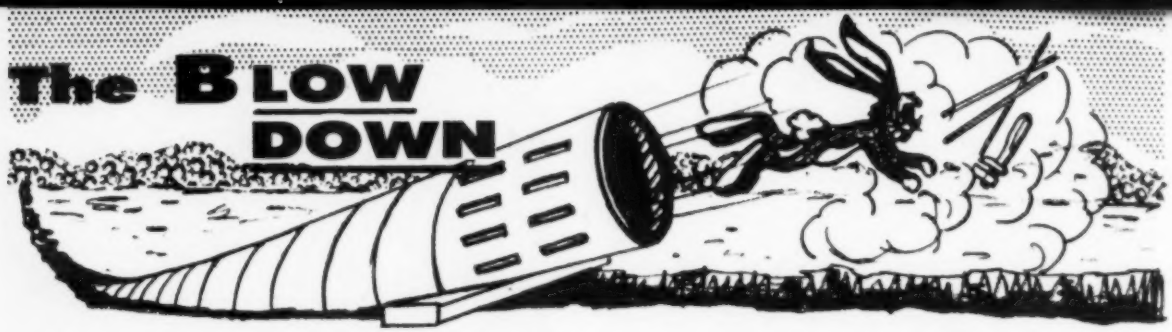


Fred Ray, Insley Mfg. Corp.; Paul Payne, Dearborn Chemical; J. W. Sharman, Sharman, Allen, Gay & Taylor.

Overjoyed at meeting an old friend is "Crutch" Crutcher, Crutcher-Rolfs-Cummings (center), shaking hands with B. C. Cowart, Barrett Division, Allied Paint & Chemical. Jack Henry, also of C-R-C, looks on.

A group of Williams Bros. Co. men: John Williams, Marvin Jones, B. E. Barnes, and C. M. Collins.

Bill Flaherty and George Stineback, Kendall Co., Polyken Sales Division, discuss the pipeline situation with William R. Connole of the Federal Power Commission.



News from the Field and Plant about People you know

PIPELINING THE CONTRACTORS. Attendance at Pipe Line Contractors Association annual meeting continues to grow. This year at Boca Raton, Florida: 668. . . . New president, the popular **Jim Neill,** head of Western Constructors, Dallas, Texas . . . other officers: **Phil Gregory,** Houston Contracting Company, Houston, Texas, first vice president; **M. S. Williams,** Panama-Williams Company, Houston; **Bob Sheehan,** Sheehan Pipeline Construction Company, Tulsa, Oklahoma. . . . New directors: **Clark Bledsoe,** Midwestern Constructors, Tulsa; **Bob Conyes,** Conyes Construction Corporation, San Pablo, California; **Phil Gregory,** Houston Contracting; **Gary Morrison,** Western Pipeline, Austin, Texas; **James Sharman,** Sharman, Allen, Gay & Taylor, Houston. Carryover directors: **Jack Gray,** Grayco Constructors, Austin; **Austin Manuel,** Williams-Austin Company, Pittsburgh, Pennsylvania; **Jim Neill; Ken Owen,** Parkhill Truck Company, Tulsa; **Bob Sheehan; John Williams,** Williams Bros. Company, Tulsa; **M. S. Williams.**

Caterpillar Tractor Company's steak roast was an elaborate affair, as it is each year. Representing Caterpillar were: **Hy Cox, K. F. Ames, Jack Gill, Morrie Fearis, F. D. Haberkorn, Tom Lobrano, Jr., H. H. Keyes, J. W. Mohler, G. E. Spain, V. L. Carlson, Jim Edel,** and **Lou Dauer.**

Ably representing H. & L. Tooth Company, Montebello, California, were **Mr. and Mrs. Dick Launder** and **Mr. and Mrs. Gene Drysdale.** This company sponsored a buffet dinner and dance.

A special luncheon was by courtesy M. J. Crose Manufacturing Company, Tulsa, and elsewhere. . . . Excellent floor show. . . . Crose people present were **Mike Curran, T. J. Behrenfeld, John W. Brand, Buddy Davis, Paul Evans, Dick Horton, Clare Miller, Ben Montgomery,** and **John Schrawger, Jr.**

PLCA is one meeting well attended by the ladies. . . . Allis-Chalmers Manufacturing Company, Milwaukee, gave a luncheon for the ladies at the Marlin Beach Hotel, Ft. Lauderdale. . . . **L. D. Craggs, A. E. Dorn, J. M. Haile, William Jachthuber, F. L. Boyle,** and **Claude M. Evitt,** were A-C men at the meeting.

A cocktail party by International Harvester Company, Chicago, contributed importantly to the entertainment side of the meeting. . . . Present from I-H were **E. L. Boughton, Harry Broadwell, Jerry Greer, W. F. Hall, C. E. Jones, Jack Rose, Donovan Stevens,** and **Russ Burns.**

Crutcher-Rolfs-Cummings, Houston, again sponsored a luncheon and style show, the latter by Saks-Fifth Avenue . . . **A. S. Crutcher,** president of the hosting company, made the initial introductions. Other C-R-C people there were **Marvin DeWoody, C. E. Hatcher, Jack Henry, Jack Scott, John Snider,** and **Grover Swartz.**

Insley Manufacturing Corporation's breakfast on Sunday was enjoyed by early Convention arrivals, of which there were many. Acting as hosts were **Fred B. Ray, R. J. Boatman, William T. Elliott,** and **Chuck Haring.**

An innovation and one thoroughly enjoyed by some 100 participants was the golf tournament sponsored by Polyken Sales Division, Kendall Company. There to see that matters ran smoothly were **Howard Segool, George Stineback, Bill Flaherty, Bill Hodges,** and **John McGivern.**

LOBBY AND PATIO. You may not believe it but it's true: **Russ Burns,** International Harvester, broke his arm while in Boca Raton trying to kill a mosquito. . . . **Gary Morrison,** president of Western Pipeline, Inc., Austin, Texas, who had just made a "deal" with then-**Governor Allan Shivers** of Texas to join his firm, remarked that he intended to make a spread foreman out of him. However, we have noticed subsequently that the now former governor had purchased a half interest in the firm and is chairman of the board no less. . . . Again meeting **Bill Wilhite,** Midwestern Constructors, reminded of 130 deg temperature on the desert near Buckeye, Arizona, many years ago, when that company was laying a line for El Paso Natural. . . . **Paul Barkley,** Cinch Pipe Line Equipment, by doctor's orders should have been in bed at his home in Houston, but wasn't. This is your tipoff, Doc. Son **Calvin Barkley** was at Boca, too, as was **T. W. Avera.**

Morris Belson and **Ned Stearns,** of D. E. Stearns Company, Shreveport, Louisiana, had with them a new type holiday detector, for use on lines cradled into the ditch. Said it had been tested on the job and would soon be in production. . . . **Roy Parkhill,** who now operates solely in Canada as Canadian Parkhill, Ltd., down from Toronto. Said his firm strung about 1000 miles of pipe in 1956, mostly large diameter.

Majestic Contractors, Ltd., Edmonton, Alberta, Canada, and Shamrock Construction, Lansing, Michigan, were announced as new members of the association. Attending for Majestic was **W. A. Rose;** for Shamrock, **H. F. Finnerty** and **R. E. Hively.**

New officers Pipe Line Contractors Association. Bottom row: Bob Sheehan, Phil Gregory, Jim Neill, M. S. Williams, Clark Bledsoe, Bob Conyes. Top row: Austin Manuel, James Sharman, Jack Gray, Ken Owen, John Williams, Gary Morrison, Dick Gump.

DO A BETTER COMMUNICATIONS JOB WITH MOTOROLA MICROWAVE

Motorola multi-channel microwave facilities can transmit:
VOICE • CONTROL • COMMUNICATIONS • VIDEO

ECONOMICAL The most economical type of multi-channel communication.

EASY TO EXPAND Channels can be inexpensively added.

WEATHERPROOF Maximum protection from failure due to snow, ice, rain, lightning, and high winds.

VERSATILE Spans rivers, swamps, mountains, and busy city streets with ease and is virtually unlimited in length.

PRIVATE Owner has complete control of communications facilities at all times; narrow beam assures private communication.

Modern industry is increasing the emphasis on automation, data transmission, and centralized control in order to provide better protection of personnel and property, better service, and more efficient operation. Motorola microwave can provide the *complete* communications system needed for this type of operation.

More miles of MICROWAVE—IN and OPERATING

Working dependably over the years, Motorola microwave systems ranging from 7 to over 1000 miles in length are operating in all types of applications and in all kinds of weather. This greater acceptance and experience means engineering and production "know how"—equipment which performs better, lasts longer, and costs less to maintain. These extra dividends repeatedly appear in operational records of Motorola users.

PARTIAL LIST OF PETROLEUM-GAS INSTALLATIONS

Interstate Petroleum Communications, Inc.
Kentucky and West Virginia Gas Co.
Mid Valley Pipeline Co.
Natural Gas Pipeline Co. of America
Natural Gas Storage Co. of Illinois
Clinchfield Coal Corporation*
New York Natural Gas Pipeline
Ohio Oil Co.
Pan American Pipe Line Co.
Panhandle Eastern Pipe Line Co.
Sinclair Pipe Line Co.
Texas Gas Transmission Co.
Texas Illinois Natural Gas Pipeline Co.
Richfield Oil Co.
Wilcox Trend Gathering System

MOTOROLA
COMMUNICATIONS & ELECTRONICS, INC.

The *Complete* Supplier of Radio Communications Systems
Motorola Communications & Electronics, 1400 N. Cicero Ave., Chicago 51, Illinois
A Subsidiary of Motorola Inc.

LUBRICANTS for Compressors . . .

how to select them and how to evaluate their performance for both engine and motor-driven compressor units

James H. Caldwell
The Cooper-Bessemer Corporation
Los Angeles, California

THE STORY OF LUBRICATING OILS IS complicated covering a broad field, and the knowledge of operating engines and compressors comes only after years of experience.

These respective fields require specialists; therefore, the selection of lubricants for new installations should be left to the oil specialist. After the selection has been made, the issue by no means is closed. The engine operators must take over from there. It is impossible to predict the service that an oil will give by its specifications. Once in service, however, there are many ways to evaluate the merits of an oil.

The purpose of this article is to cover briefly what is involved in the selection of oils, and then go into detail on the indications that can be used to evaluate the selection.

The practical approach is first to choose a reputable oil company and have its specialist recommend an oil for your installation. Then, contact the engine builder and tell him you have chosen a particular oil company's product and ask which one of that company's oils is recommended for your model engine. After getting the recommendations, the specifications and price should be considered before making your decision.

Specifications and Tests Used by Specialists in Selection of Oils

Viscosity. This is defined as an oil's resistance to flow. The test consists of measuring the time in seconds for a specified amount of oil to flow through a calibrated orifice. The SAE number covers too wide a range to be of any value as a specification for the type of units under this discussion. SSU as determined by the Saybolt Universal Viscometer should be considered. Since this quality varies with temperature the results are usually listed at 100 F to 212 F.

Power losses increase with viscosity, an important consideration with smaller and automotive type engines. Thickness of oil film between moving surfaces also varies with viscosity. This is a more important consideration, as thickness of film has to be maintained between heavier bearings, pistons, pins and crossheads. For this classification of engines the oil companies favor a less viscous oil than most engine builders, who specify 1500 SSU maximum at 100 F and 70 minimum at 212 F. This specification embraces SAE 40 oils.

In dealing with viscosity, attention should be paid to viscosity index which is an expression of the change in viscosity with the change in temperature. In other words, an oil with a high viscosity index decreases less in viscosity at elevated temperatures than an oil with a low viscosity index. This should be a minimum of 40.

Emulsion. The tendency of an oil to emulsify with water can be measured by certain tests. A common one is to blow a sample with steam for a specified time and to note the time in seconds for the oil to separate. There is always a chance for water leaks in engines. Therefore, it is better to use an oil that has less tendency to emulsify.

Oxidation. Several tests are available for determining the tendency of an oil to resist formation of sludges and sediments. These consist of uniting oxygen with a sample under accelerated conditions. Results are of assistance to a specialist in the selection of oils for various services.

Carbon residue. This can be described as the residue left after evaporation of an oil in the absence of air. At one time it was used as a yard stick for coke deposits, which may form in engines. However, like other old standard tests, the introduction of additives in modern oils has lessened its significance. It can be determined more readily in actual operation.

Neutralization number. This is an expression of the milligrams of potassium hydroxide required to neutralize one gram of oil. At one time, it was important to have this number as low as possible. However, additives in modern oils tend to increase this number which has no significance in operation. One should know the neutralization number of the new oil before it is used. If acids tend to form for some reason in operation, then an increase can be noted by this test. Even so, its value then has to be judged carefully, as lower concentrations of certain acids have more effect on engine parts than higher concentrations of other acids.

Corrosion. All oils are tested in the laboratory for corrosion. This information is valuable to oil specialists when selecting a lubricant for any particular engine. They are well versed in the various bearing materials used by engine manufacturers, which may require certain oils. However, this information applies mainly to special bearings used in very high output engines not included in this article.

Dispersion. Ability of an oil to disperse fine carbon particles. It is important in all installations, but has more significance in diesel and gasoline engines.

The following tests are used for information other than performance prediction. Since some operators erroneously use them for performance evaluation, a brief note on each is in order:

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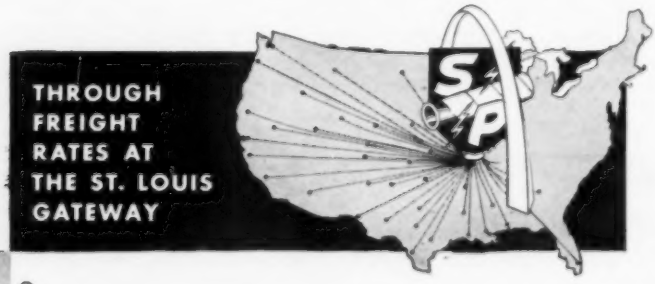

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Flash and fire point. These are determined for the purpose of safety in handling and storage. They have no value in predicting performance.

Gravity. This is an expression of weight per volume. It is an indication of the source.

Pour point. This is the temperature at which an oil will flow. Knowledge of it is of value in cold climates.

Mineral Oil vs Additive Oils

A mineral oil is a refined petroleum with possibly oxidation and corrosion inhibitors added.

Additive oils (known by some as detergent oils) are refined petroleum oils to which additives are compounded to give them the following properties:

Detergent or cleansing action
Resistance to oxidation and corrosion
Extreme pressure qualifications
Greater wetting ability, etc.

They come under three classifications:

(1) Heavy duty oils, which meet Mil-L 2104 A specifications
(2) Series 1
(3) Series 2

Generally, the percentage of additives increases in the order mentioned. Series 1 and 2 oils will not be considered here as they are for locomotive, dragline and very high out-put engines.

Mineral oils perform satisfactorily in the low out-put, slow speed engine. Certain individuals have never accepted the use of heavy duty oils in the modern engine-driven compressor crankcase. They contend they are not necessary and do not justify the increase in price. Others feel that heavy duty oils for this classification are detrimental. They are of the opinion that the ash formation causes wear. The oil specialist responds by stating that the ash residue is not abrasive. The individuals do not agree and further add that the ash dilutes the lubricant, particularly in force feed cylinder lubrication, tending to form a paste.

Although it is difficult to be factual since there are too many variables involved to form an opinion, the writer has noticed many very clean crankcases in which heavy duty oils have been used. Furthermore, some engines form entirely too much sludge when straight mineral oils are used. The ash content which exists with some heavy duty oils has been noticed, but the writer has never been able to pick up wear caused by this ash formation. This view may be subject to change for in two cases where Series 2 oil (high concentration of additives) was used some wear was noticed. However, the out-put of the modern compressor engine is not at its peak; the end of

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increased horse power for the engine in the subject classifications is not in sight; and in the opinion of the writer, heavy duty oils will have to used, unless the metallurgist can keep up with the increasing horse power trend.

Evaluation of Lubricating Oil Performance

Even though considerable thought must be given to the selection of oils for an installation, performance in operation is what counts. Even if the specialist has made the correct selection, certain variables in operation may make the selection look bad. Therefore, one of the most important functions of the engine specialist is to determine if an oil is doing the job. With a little reasoning this is very easy and does not take very long to determine.

In a new installation, or where a new type of oil has been used, the operator should run frequent crankcase inspections. These should be one month apart until a trend has been established. If an oil is not performing, sludge formation may be noticed in the crankcase.

In four-cycle engines this formation may also show up on the cam shaft housing or around the valve springs and rocker arms. The walls of the crankcase should be inspected for sludge or oxidized particles left as oil washes down into the sump.

In the case of wet sump engines, the palm of the hand should be pressed firmly on the bottom of the crankcase and if any sludge has settled there, it will adhere to the hand. Filters should also be inspected for abnormal rate of sludge formations. If sludge exists in the filters it is unusual as filter life in gas engines is good.

Another form of oxidation, more dangerous and more difficult to detect, is varnish or lacquer formation that sometimes gives the crankcase a brighter appearance. These formations (appearing on finished surfaces such as crankshafts, piston pins and pistons) sometimes get past filters, whereas most of the sludge formations are stopped there. They are dangerous as they take up clearances between rubbing parts.

In addition to checking for the above indications, it is not only recommended but essential to **send samples of used oil to laboratories for analysis.** The viscosity, neutralization and sediment test will indicate presence of oxidized particles. If the visual or laboratory analysis indicates anything out of order the oil specialist should be consulted immediately. It could be that the oil is not at fault; it may be improper operation or something wrong with the engine. An oil not doing a good job can ruin an engine; conversely, an engine in poor operating condition can break down oil.

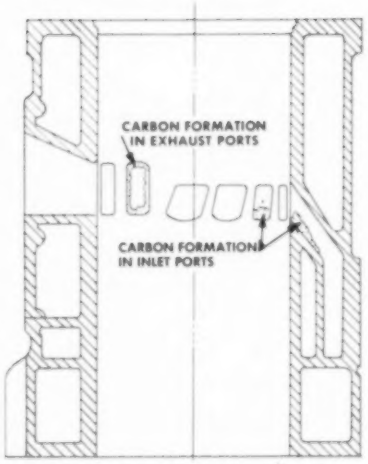

FIG. 1

Port Carboning

In two-cycle engines, an excellent way to evaluate oil performance is to check for excessive exhaust and intake carboning. Not all port carbon problems are caused by quality of the lube oil. Much is to be done on that score. However, an oil with carbon forming tendencies will clog the ports. This can be checked by noting increase in the scavenging air pressure. The importance of keeping ports clean cannot be emphasized sufficiently.

The quantity of oil fed to the cylinders through lubricators has a bearing on the amount of carbon formation in the ports. The old expression, "If some lubrication is good, a little more won't hurt," has no place here. A few comments on how carbon is formed will substantiate this.

Carbon formation is illustrated in Fig. 1. In order to give a clear illustration, the formation is shown only in two inlet ports and one exhaust port. If the piston happens to be near the top center when a drop of oil enters the cylinder from the lubricator, the bottom edge of the compression ring, on the downward stroke, spreads the oil over the entire surface of the cylinder.

As the ring passes the exhaust and inlet ports, some oil is scraped into them. Just before the top compression ring uncovers the exhaust port, the gases in the cylinder have expanded down to about 50 to 60 psi. The instant the ring uncovers the exhaust ports there is considerable wire drawing and heat. Therefore, the oil that has been scraped into the exhaust

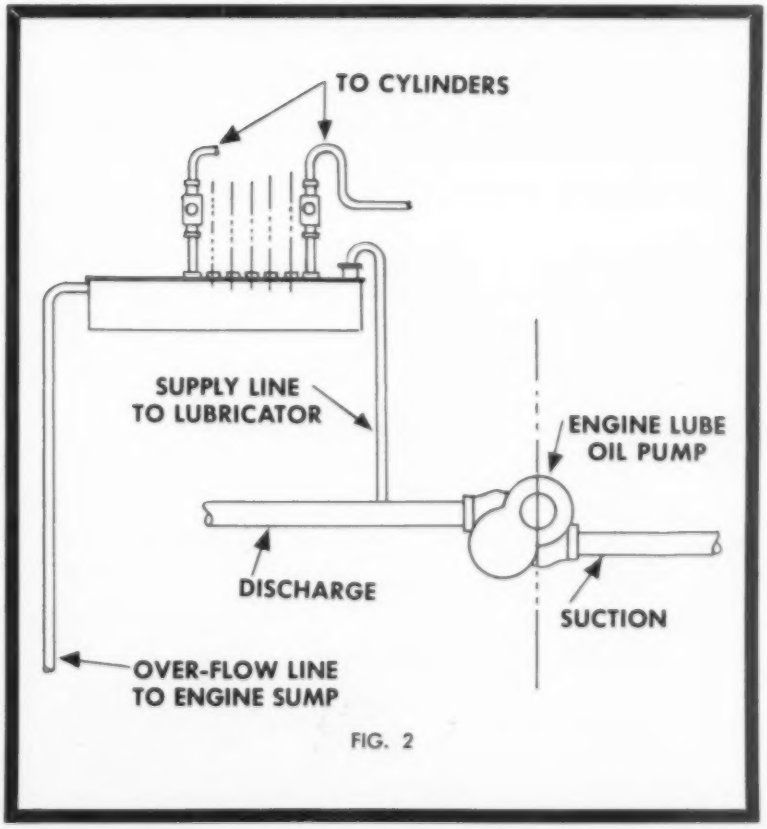

FIG. 2

ports is blown and burnt out the exhaust. However, if the engine is lightly loaded the blow-down pressure and temperature is not as great and carbon may form in the exhaust.

As this piston travels toward bottom center, the inlet ports are uncovered. At this position, the exhaust ports have not been uncovered sufficiently and long enough to blow down the cylinder completely. Therefore, oil that has been scraped into the inlet ports is blown for a considerable distance into the ports.

The incoming scavenging air overcomes the blow down pressure but by that time the port has cooled to a point where carbon forms, leaving it in the location shown. The oil that escapes the ports and passes down the bridges is scraped back up into the ports by the piston and rings on their upward travel.

It can be seen, therefore, that the excess oil that is not required for proper cylinder lubrication ends up as carbon in the exhaust or inlet ports. Little need be said about the seriousness of clogged ports. The correct approach is to adjust the cylinder lubricator pumps to discharge just enough oil to give a film of lubrication over the walls preventing ring and cylinder scuffing. If the proper film is maintained, it will burn off without forming carbon.

Lubricator Discharge

The following formula can be used to determine the proper amount of oil to be discharged from the lubricators:

$$\text{Gal Per Day} = \frac{\text{Name Plate Rating (BHP)} \times 24}{10{,}000}$$

Example: for a 600-hp, six cylinder engine with two feeds, per cylinder

$$\text{gals per day} = \frac{600 \times 24}{10{,}000} = 1.44$$

or 1½ gal per day

There are roughly 40,000 drops of oil per gallon. For this engine that would mean 60,000 drops per day for 12 feeds or 3½ drops per minute per feed.

The practical procedure would be to start out with about five drops per minute from each feed and then record the actual quantity used per day in gallons. The feeds should then be reduced by like amounts until 1½ gallons are being used per day.

When additive oils are used, the oil passes through the lubricator sight classes in a long string. In that case, one will have to estimate during the initial setting, as it is difficult to count drops per minute. It is possible to adjust all feeds evenly; however, some operators have built calibrating stands that are highly recommended.

Before engines are started or during each overhaul, they remove the lubricator from the engine and install it on the calibrating stand. This stand has an electric motor which drives the lubricator at the same speed it operates on the engine. Oil discharged from each pump is collected in a calibrating tube which can be used for adjusting all pumps to give the correct amount of oil. This stand is also an excellent place to check condition of plungers and cams of the lubricator.

On the subject of lubricators, it is worth mentioning that in some installations, particularly unattended engines, a small ¼-in. OD copper line is tapped into the discharge line of the engine lube oil pump. This line is run to the top of the lubricator tank as shown in Fig. 2.

An overflow line is run from the tank back to the engine sump. With this arrangement it is not necessary to have the operator fill the lubricator every day. This device is time saving, but the fallacy is that any engine lube oil pump will pick up a certain amount of air.

This air, which gets trapped in the lube oil, ends up in the lubricator. Since the lubricator pumps have a very

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small displacement they cannot be adjusted to the prescribed quantity in the above formula. Therefore, in those installations piped per Fig. 2, the operator, in order to guard against lines becoming air bound, has to adjust the lubricator to discharge too much oil, thus adding to port carbon trouble.

In those installations that have full flow filters (not metal edge) this can be corrected — that is, the full flow filter has a vent which continuously bleeds trapped air back to the engine sump. If the ¼-in. supply line is tapped into the line after the full flow filter, then the chance of the lubricator being filled with air entrained oil is eliminated.

Power Cylinder Lubrication

The formula for determining the amount of power cylinder lubrication was established by actual experience. However, the writer knows of two cases where power cylinders were not scored when the lubricators were inadvertently left inoperative. Cylinders cannot operate without lubrication. Therefore, one would have to assume that in those two cases the oil control rings on the power pistons were in poor shape and, fortunately, were letting too much oil get by. Thus we may say:

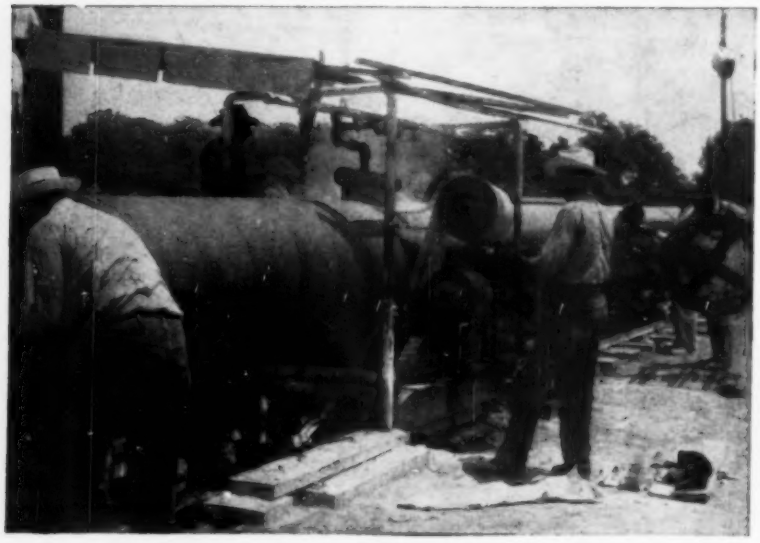
(1) The amount of oil prescribed by the formula appears to be small but some help is realized from oil escaping past the oil rings.

(2) As engines approach the day of needed overhaul, port carboning will increase as the excessive amount of oil, escaping past control rings, not needed for cylinder lubrication ends up in the ports as carbon.

(3) If progress on better oil control (conformable oil control rings) continues, the formula may have to be changed accordingly.

The above discussion also brings out the fact that the compression rings transform the oil drops injected in the cylinder into a uniform film over the entire cylinder wall. If cylinders, after a number of years get out of round, the rings will not change the drop into a uniform film. Cylinders should be checked for excessive out-of-roundness during overhauls. For this reason and because of cylinder glaze, an air or electric driven hone is highly recommended, particularly after the engine has been in operation for a number of years.

Another way the engine specialist can evaluate performance of oil is to check for carbon formation in the piston crown as illustrated in Fig. 3. This illustration pertains to an oil cooled piston. In the case of dry piston engines all the heat transfer from the piston takes place through the piston rings, to the cylinder walls and into the jacket water.



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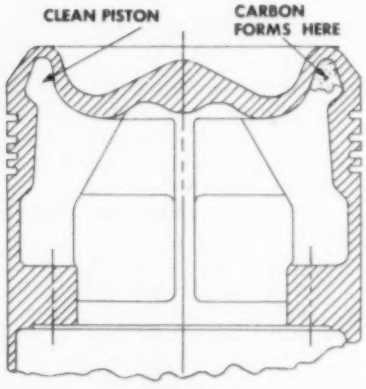

FIG. 3

In the case of the dry piston, the ring belt is located differently than in the oil cooled piston.

In the oil cooled piston almost all heat transfer is into the lubricating oil that is passed through the piston. In order to route the heat transfer to the oil ring the belt for this type piston is located differently.

If, however, carbon forms as shown,

heat transfer cannot take place through the oil. If it cannot pass through the oil it has to go out through the rings into the jacket water. However, the ring belt is not correctly located for this condition which results in a heat dam where elevated temperatures will exist causing cracked pistons.

The thickness of crowns in oil cooled pistons is sometimes ¼ that of dry pistons. The reason for the thinner crown is to give good heat transfer resulting in lower crown temperature and longer piston life. If carbon is allowed to form as shown the heat cannot transfer to the oil, thus making for high crown temperature and failure of the thin section.

Most engines have piston pin housings and as engines are overhauled the piston and connecting rod is removed as a unit. Some operators do a good job of cleaning the rings and outside of the piston but seldom take the housing out of the piston to inspect for carbon formation as shown in Fig. 3.

If operation has been normal and if the oil has been doing the job, crown carbon will not form and it should be unnecessary to remove the pin housing. Since no one knows this without looking, it is recommended that during an overhaul the piston and pin housing be separated for crown inspection. If excessive carbon is found it should be removed after the oil specialist has been consulted.

Bearing Inspection

Bearing inspection is another check on oil performance. The statement can be made to the effect that almost all bearing failures **are not** caused by oil that has been free of dirt. Oxidized oil will attack bearings, particularly those in which lead base babbitt is used. (Lead base babbitt bearings do have their merits.) Furthermore, for this and other reasons, the oil should not be oxidized. The chances of bearing metal being attacked are small.

In one case certain elements of the bearing were attacked leaving the bearing black in appearance and much harder than the original bearing. The bearing did not wear at all but the very small voids left by the attacked elements filled with abrasives and wore the crankshaft journals as much as .011-in.

On other occasions, oils that were permitted to reach high neutralization numbers attacked the babbitt so severely that none was left. As in the previous case, the remaining bearing shells were black and a soft pasty substance was deposited in the crankcase. The writer has also seen the lead plating completely removed from pistons by oxidized oil.

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exist in engines they will form on bearing surfaces. They are harmful because bearing metals are chosen for their surface action qualities, and these are destroyed by the presence of these formations. Lacquer and varnish also form an excellent binder for dirt that actually laps the crankshaft.

The significance of the above examples is that oil performance can be evaluated by inspection of bearings for appearance as described. Sludge, varnish, and lacquer formations should be noticed in other locations and eliminated long before they appear in bearings.

The above examples are sure indications that the engine specialists can use to evaluate oil performance. As mentioned previously, the oil specialist can use laboratory tests of used oil to evaluate its performance. An increase in viscosity and neutralization number are sure signs that the oil has broken down. Other tests are likewise valuable but in those cases the oil expert should be consulted.

When To Change Oil?

Many times the question has been asked, "How often should the oil be changed?" No set time can be established as each installation is different. Oils have lasted from three months to ten years. Load and length of time the engine is permitted to operate in need of overhaul complicates the answer to this question.

The direct answer is **When it is necessary,** and it is necessary when the aforementioned indications appear.

Gas Injection Valve Lubrication

Sometimes, gas injection valves of some two-cycle engines are lubricated with ordinary greases that tend to form carbon in the gas passages as shown in Fig. 4.

This formation upsets load balance between cylinders that can result in serious damage. It is recommended that a high temperature grease be used. These valves are often over lubricated, with the result that more carbon is formed especially if ordinary greases are used. If the valves are over lubricated with a high temperature grease, it flows into the combustion chamber resulting in detonation. A good practice is to give them one shot with a grease gun daily.

Motor-Driven Compressors

Discussion so far has centered around engine driven compressors. In regard to the crankcase of motor driven compressors, the problem is not too difficult. A good grade of mineral oil with oxidation and corrosion inhibitors will perform satsfactorily. During crankcase inspection the oil should be checked for presence of dirt and the oil temperature should be maintained high enough to keep away from condensation. Oil samples should be taken to the laboratory periodically because little make-up oil is added to these units and if something happens to the oil, the offending concentration builds up faster than in engine crankcases.

Compressor Cylinders

In the case of compressor cylinders, the old saying that not enough or too much oil is detrimental holds true. If there is insufficient lubrication, liner and ring wear, and scuffing will start. If the cylinders are over lubricated the excess oil will end up as carbon in valve assemblies resulting in plate breakage. With bakelite valve plate, they become soaked and do not function properly. Also, the excess oil ends up in piping and receivers, which betters chance of fires and explosions particularly in air machines.

The correct amount of oil to be used in compressors is difficult to determine, as type of gas, presence of dirt or liquids, ratios, etc., complicate the problem. The following formula can be used as a start for determining the amount of oil to be used:

$$\text{Rate of oil, gal per day} = \frac{D \times S \times N}{300{,}000}$$

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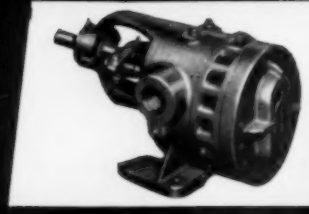

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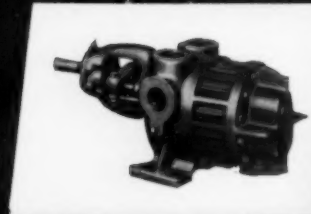

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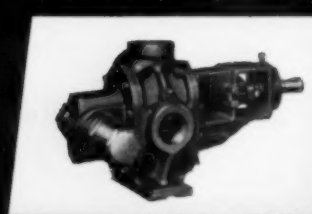

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A simple expansible tube serves as both diaphragm and valve. It's the only moving part, and outlasts ordinary valve mechanisms many times over. Instantly responsive, it closes over scale or foreign matter without leakage or damage. Shown here are typical town border and distribution station installations. Grove *flexflos* are also proved for more effective service with air, water, oil, and special fluids. For more accurate control, longer trouble-free service, and lower maintenance, investigate Grove *flexflo*.

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GROVE SIMPLICITY ACCURACY SAFETY

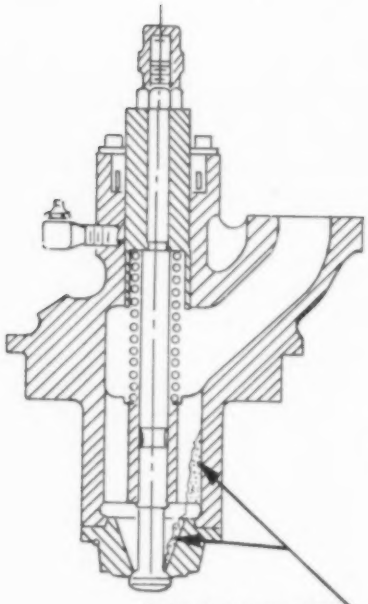


FIG. 4

Where D = Total diameter of all cylinders and rods in inches

Where S = Length of stroke in inches

Where N = Speed in rpm

The quantity as determined by the above formula can be altered after the cylinder has been in service and inspected for dryness and any scuffing tendencies.

The type of oil that should be used in compressor cylinders depends upon several variables, mainly the kind of gas being pumped. There are many different gases pumped by compressor cylinders, each requiring a special lubricant, and it is beyond the scope of this paper to go into all of them. However, natural gas and air cover a majority of installations and selection of lubricants for them should be included here.

A high grade SAE 40 solvent, refined mineral oil containing an oxidation and corrosion inhibitor, can be used for natural gas. If the gas is wet the lubricant should be compounded with a non-soluble vegetable oil, acidless tallow or animal fat. Regardless of the dryness of the gas it is good practice to use the above compounded oils during start-up or new installations or if a major piping change has been made.

Contractors do an excellent job of cleaning lines but it is impossible to eliminate all the dirt. These oils will give the cylinders and rings a chance to seat before scuffing, due to dirt, takes place. Some people break in their cylinders by using steam cylinder oils or a 50-50 blend with mineral oil.

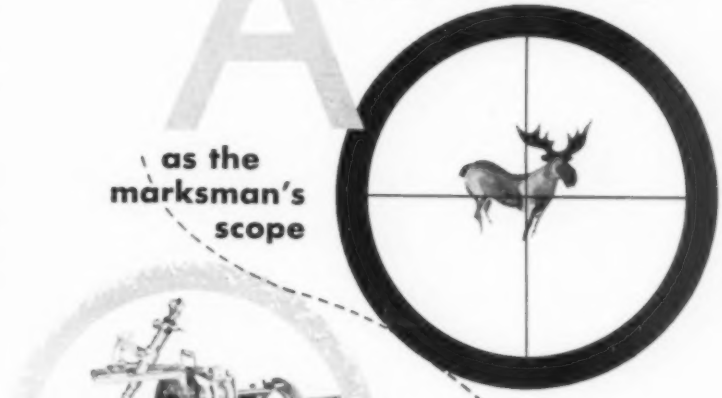
These oils are highly recommended for rod packing lubrication during break-in, as a majority of packing troubles occur during start-up of new installations. The dirt that is in the gas finds its way into the packing with little chance of getting out. It takes a short time for packing to seat and there will be some blow-by during start-up but if it continues it is important to dismantle all grooves of the packing and clean all dirt from each cup. This practice will save the rod and packing. In that regard, there are too many cases in older installations in which packing is changed without thoroughly cleaning the cups.

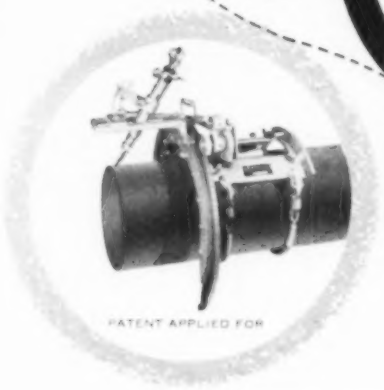
Air compressors, due to moisture in the air, require the use of an oil compounded with 3 to 5 per cent of acidless tallow that contains an oxidation and rust inhibitor and has a low carbon content. Another way of getting around the moisture situation is to make use of very efficient automatic dump traps between stages. Traps have always been used but the fact that they should be adequate cannot be over emphasized. This is also important in the so called dry locations. Moisture can give trouble in localities with humidities as low as 10 per cent.

In the internal combustion engine it is very easy to evaluate oil by per-

ACCURATE

as the marksman's scope





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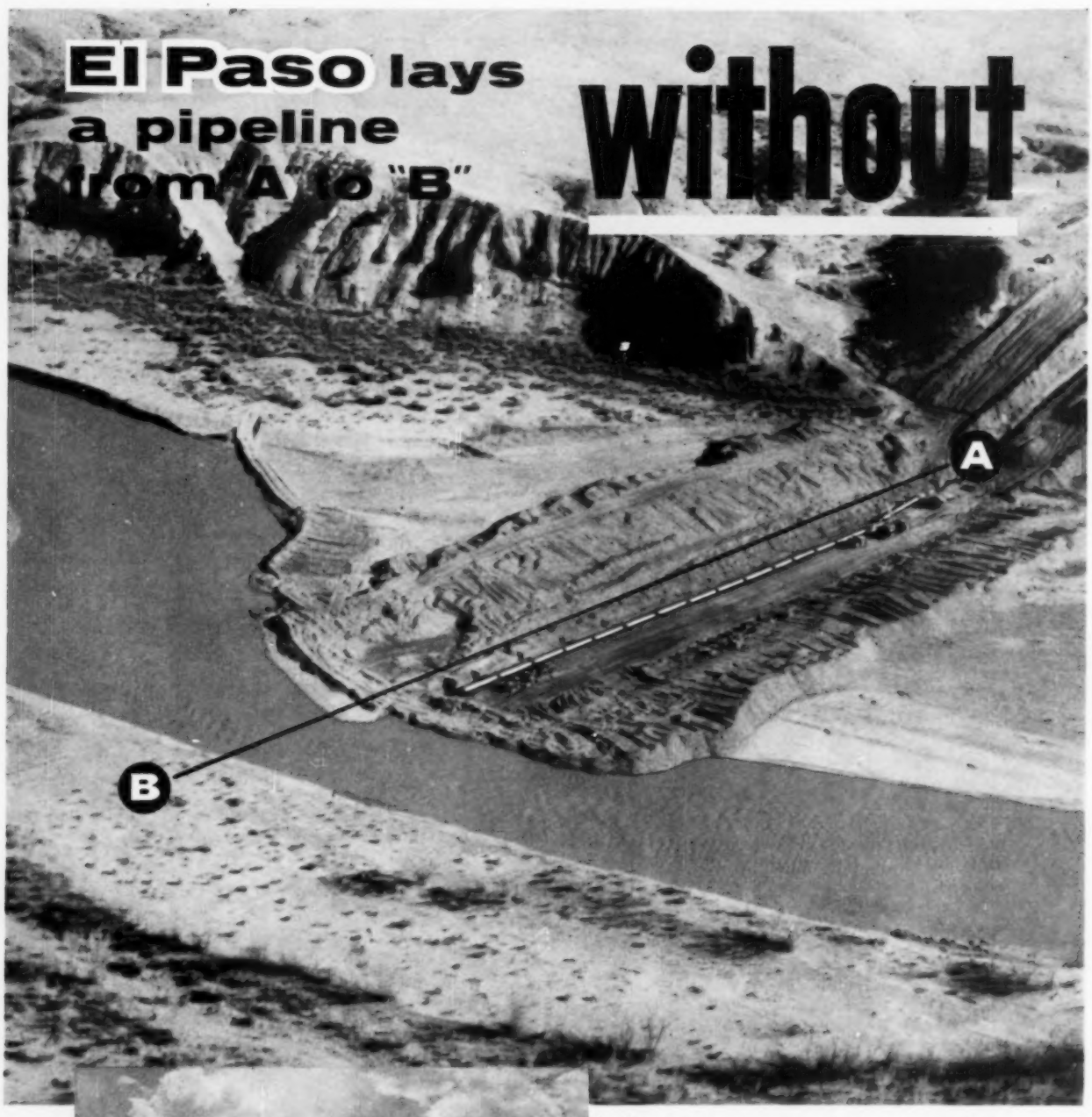
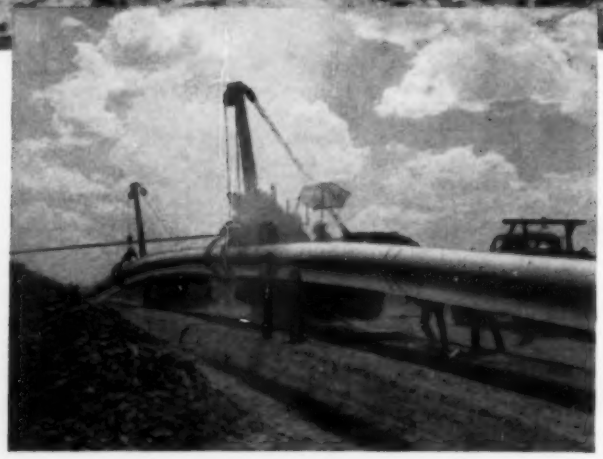
El Paso lays a pipeline from "A" to "B" without





El Paso spreads cross the San Juan river in northern New Mexico. Pipe was first laid to the edge of the main channel. Then an earthen dam was built upstream. Water flow shifted over the section of line near the far bank and the 800-foot crossing was completed. Trench depth averaged 20 feet, pipe was anchored every 40 feet with tie-down clamps bolted 9 feet deep in the shale.

Laying the 34-inch pipe across the red desert of the Navajo Indian Reservation of Northern New Mexico.

From San Juan, New Mexico, the line travels across the red desert of the Navajo Indian Reservation of Northern New Mexico and through the Foothills of the San Francisco Mountains in northern Arizona near Flagstaff. Near Holbrook, Arizona, it extends under the little Colorado River (approx. 500-ft. crossing). At its terminus, the line stretches 1,100 feet across the Colorado River on a pipeline suspension bridge being built jointly by El Paso and Pacific Gas and Electric Company.

FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD

crossing the river!

THEY PUSHED THE RIVER ASIDE! El Paso Natural Gas Company laid their line to the edge of the main channel first, then temporarily diverted the river and used dry land methods to lay the pipe through the main channel. El Paso spreads report the crossing went without a hitch, and was less expensive than going under or over the river by usual methods.

Completed line to increase capacity by 450,000,000 cubic feet per day

Taking approximately 350,000,000 cubic feet daily from the San Juan Basin and another 100,000,000 cubic feet from the Permian Basin, the San Juan-Topock project, as it's called, will increase the company's total deliveries to over two and one-third billion cubic feet daily. Begun in early 1956 and scheduled for completion in early 1957 the new line will supply an additional 350 million cubic feet daily to customers in California and an additional 100 million cubic feet daily to customers in Arizona, New Mexico, Texas and Nevada. The 34-inch line, for the most part, will loop two existing lines (24 and 30-inch) which extend from the San Juan Basin to Topock on the California border.

A. O. Smith supplying 34-inch pipe for two-thirds of 338-mile project

Approximately 224 miles of 34-inch pipe was shipped to El Paso spreads from A. O. Smith Corporation of Texas' plant at Houston. For almost 30 years A. O. Smith line pipe has always been manufactured to a high standard of quality . . . precisely controlled at every step of production. That's why A. O. Smith pipe, made and installed in 1928, is still in operation. That's why so much A. O. Smith pipe is in nearly every important high-pressure line.

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formance in service but compressor lubrication is a little more difficult. Quality and selection have a bearing on scuffing but there are too many other variables that may make the oil look bad. In addition to moisture and dirt problems, improper piston to cylinder clearance will result in scuffing.

Operating too long with one or more bad valves is another which is old as the hills but still exists today. Anything that causes excessive gas discharge temperatures, like operating at ratios higher than design, will result in piston seizure. A high differential in inlet and outlet jacket water temperature will cause distortion resulting in seizure. Violent line surges have caused ring flutter resulting in cylinder and ring wear and subsequent ring breakage. In each case before the source of trouble was found, an attempt was made to change lube oil whereas a change in piping corrected the trouble.

All this is not meant to minimize the fact that proper lubrication is important, but too little attention is paid to such facts.

Acknowledgment

This discussion was presented at the California Natural Gasoline Association meeting, Los Angeles, California.

★ ★ ★

HE'S THE MAN who helps your pipe coating jobs move along smoothly — on schedule. He's there before the kick-off, making sure that enough LION E-120 asphalt coating is on hand, packaged in easy-to-open containers which one man can handle. He checks all equipment, inspects the kettles, adjusts the shoes and makes a careful examination of all surfaces to be coated. He's your HOLCOMBE service engineer.

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So on your next pipe coating job, no matter how big or how small, let us know in advance. We'll see that you have an experienced HOLCOMBE engineer at the site, well ahead of kick-off time.

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Pipe Wrappings • Graphite Anodes • Coke Breeze

Ohio Fuel Plans Three Storage Fields

The Ohio Fuel Gas Company, Columbus, Ohio, has asked the Federal Power Commission for a permit to activate and develop a new storage field in Vinton County, Ohio, to be known as the McArthur Storage Field. The installation will include 15.1 miles of various diameter pipeline and a 3300-hp compressor station. Initial input capacity of 10,000,000 cu ft per day would be increased to 85,000,000 cu ft daily in 1958. Output capacity would be 40,000,000 and 70,000,000 cu ft for the peak days of 1959 and 1960, respectively.

Ohio Fuel also seeks authorization for the installation of superchargers and new compressors on units at the Wellington storage compressor station in Medina County, increasing the station's rating from 3200 to 4320-hp and the input rate from 40,000,000 cu ft per day to 54,000,000. The output rate is 190,000,00 cu ft per day.

Ohio Fuel proposes to activate and develop two additional storage pools in the Holmes Storage Field in Holmes, Wayne, and Ashland counties, including the installation of approximately 16.4 miles of various diameter pipeline. The maximum deliverability of the two pools would be 35,000,000 cu ft daily.

Shamrock Plans 35-Mile Line in Texas Panhandle

Shamrock Oil and Gas Company of Amarillo, Texas, will lay a 35-mile, 6-in. crude oil line from its McKee station, Moore County, Texas, to Hansford and Ochiltree counties. Capacity will be 5000 to 6000 bbl a day.

Transco Plans Boost In Compressor Horsepower

The Federal Power Commission has granted Transcontinental Gas Pipe Line Corporation temporary authorization to construct and operate natural gas facilities in Texas and Louisiana at an estimated cost of $3,655,000.

Temporary authorization was granted for the construction of the 880-hp Mission Valley booster station in Victoria County; an 880-hp booster station and dehydration plant in Luby field, Nueces County, and an 880-hp booster station, a dehydration plant, and a purchase meter in Greta field, Refugio County, Texas. The temporary authorization also includes the installation of an additional 3550-hp at compressor station No. 23 in Harris County, Texas, and an additional 5000-hp at compressor station No. 24 in Beauregard Parish, Louisiana.

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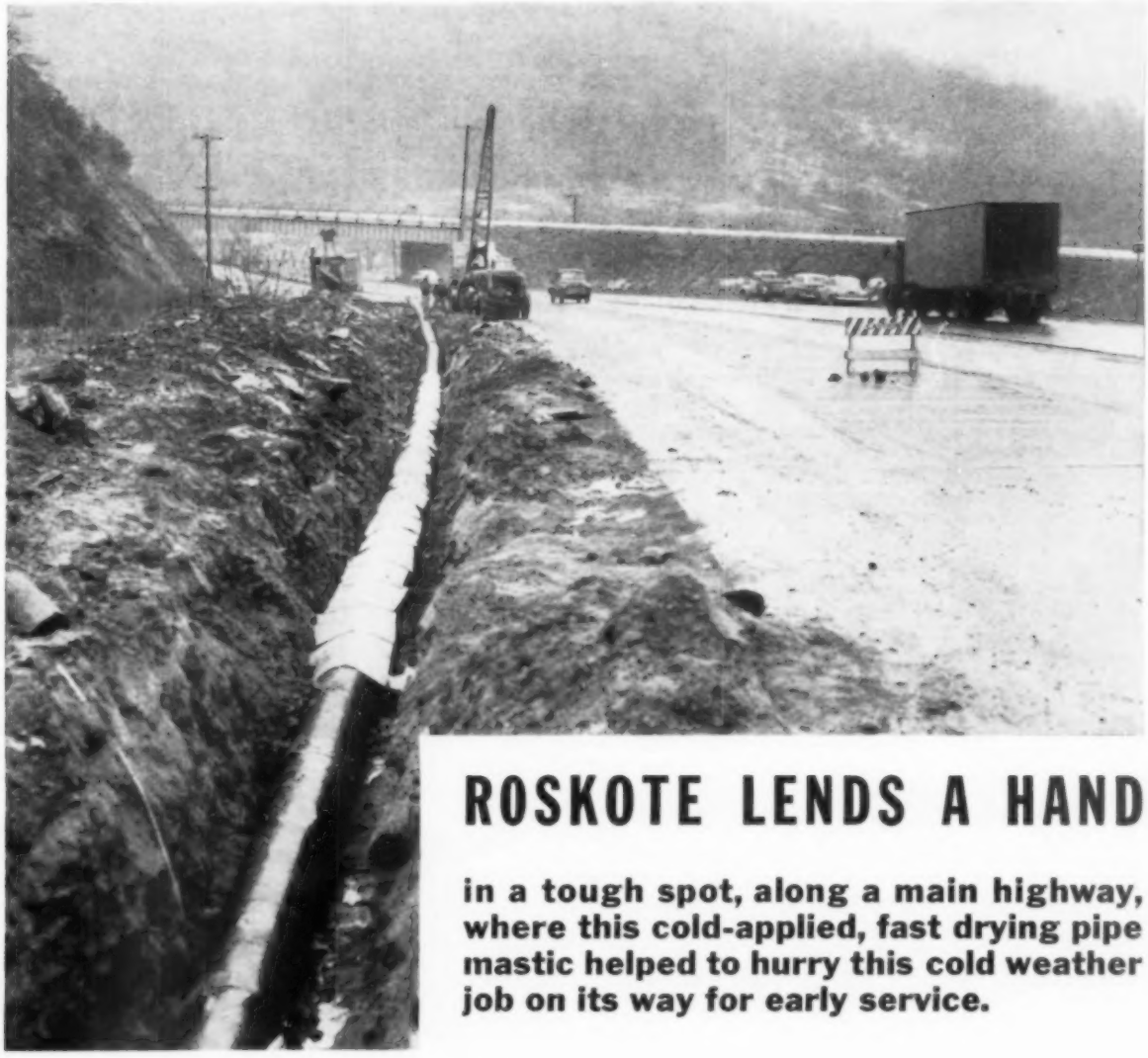

ROSKOTE LENDS A HAND

in a tough spot, along a main highway, where this cold-applied, fast drying pipe mastic helped to hurry this cold weather job on its way for early service.

A large portion of Equitable Gas Company's 18½ mile "Delmont Line" of 16" pipe, was laid 3 feet from the edge of U.S. 22. Cold application of Roskote was ideally suited because of limited working space and it accelerated completion of the line. The pipe was given two coats of Roskote Cold Applied Pipe Mastic and a wrapping of felt. Pipe line padding was used where undesirable backfill was present. For complete information on Roskote, with its high resistance to electrolytic and chemical corrosion, write:

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When Should Equipment Be Replaced?

It may be economical to replace a machine even when it appears to be operating satisfactorily. Here is how you can decide

WHEN should equipment be replaced?

How can the most economical time for replacement be determined, especially when present machinery appears to be operating satisfactorily?

These are questions posed quite frequently in the minds of many owners. The replies appear to have been as numerous as the people seeking answers.

Several methods are now in use to determine the economical time to replace. One owner pointed out that when a tractor reached an age of three years it became a headache. He didn't like headaches, so he replaced his tractor every three years. Some companies replace their tractors just before a major overhaul is needed. Another method is to replace older machines whenever there seems to be some extra money in the treasury.

To aid equipment owners in detecting the point of lowest possible hourly operating costs, Caterpillar Tractor Company has developed what it calls the Metre Method (Most Economical Time to Replace Equipment). This important factor can be removed from the realm of intuition and evaluated on a dollar and cents basis. The degree of accuracy, of course, depends upon the specific data the owner can supply from his own records. This method was worked out primarily for crawler tractors, but it can be applied to other types of equipment.

Before getting into the mathematics of economical replacement, it is important to review some of the factors to be considered. The first and most evident factor is major repair and overhaul costs. Of equal importance, although not so apparent, are the costs of productivity, unavailability, and capital decline.

Major Repair and Overhaul

As the tractor, or any other piece of equipment, gets older, the repair cost gets higher. For example, the engine will require only rings, liners, and a valve job on the first overhaul, but on the second may require new crankshaft, bearings, and pistons, plus the same items as on the first. A similar pattern would apply to the cable control, master clutch, steering clutches, and other components serviced as a whole. Attachments can be included, and tires substituted for track components on rubber-tired units.

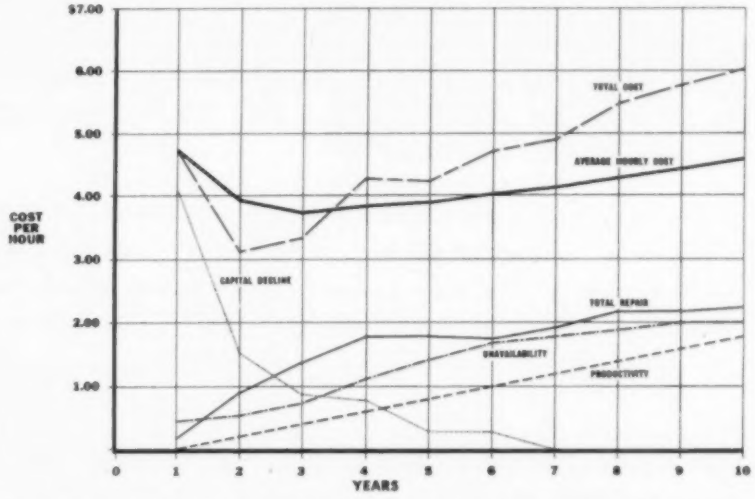
Productivity

One of the most difficult factors to measure is productivity. Improvements are being made constantly. Tractor horsepower has increased approximately 20 percent in the last 10 years. Although horsepower is not directly proportional to increased production, other improvements, such as hydraulic-boosted controls, better visibility, and better stability, increase at about the same rate as horsepower.

If an old tractor is used, it should be charged with the difference in ability to produce between it and a new machine. The old tractor should be charged for its inability to produce as much as the new tractor.

This charge should not be made in all cases. If the old machine can supply all the needs demanded of it, a new machine can add no productivity. In this case productivity is governed by the unit it is working with, rather than the tractor itself.

This charge may be made in several ways. If it is working alone, a fair, although conservative, way would be to charge the tractor with the cost of renting a machine to make up the lost production. If the tractor is pushloading scrapers, for example, it should be charged with the cost of renting a push tractor and scrapers to make up this lost production.



Here are the steps involved in determining the most economical time to replace equipment.

Step 1. First consider total major repair and overhaul costs. These increase as machine ages. Productivity decreases in a straight line due to increased ability of new equipment. (See "Total Repair" and "Productivity" lines.)

Step 2. Unavailability increases as a machine gets older, requiring more frequent adjustments and repairs; and each year it decreases in capital value. (See "Unavailability" and "Capital Decline" lines.)

Step 3. Combining these four factors a total cost for the machine is arrived at, reaching a low point at the end of the second year. The yearly costs then start to rise as machine gets older and less efficient. (See "Total Cost" line.)

Step 4. The most economical time to replace equipment is determined by averaging total costs for each year up to that time. They reach the lowest point about the third year, then begin increasing. Each year after that the machine is operated at a higher average cost per hour. (See "Average Hourly Cost" line.)

Availability

The machine also should be judged on the basis of availability, or the number of hours the machine is down in comparison to the number of hours it could have worked. This should not include time for major overhauls, but should include any delays for minor adjustments, repairs, and greasing.

A new tractor usually will be available about 96 percent of the time. The older a machine, the more time will be required for adjustments and repairs. To charge a tractor for not being available, compute the cost of renting a comparable size machine during the time the tractor is not available.

Capital Decline

Usually equipment owners do not replace equipment every season, because the difference between original cost and trade-in value would cause prohibitive operating costs. This difference is called "Capital Decline." This cost, the difference between purchase price of a current machine and true value of the existing machine, should be charged to the tractor in the year the decline occurs and not averaged over the life of the machine.

Metre Method

To determine the most economical time to replace equipment, find the total cost of major repairs and overhauls, productivity, availability, and capital decline for each year. Then average the costs of the first and second years to find the average cost per hour if traded at the end of two years. Do the same for the first three years, and so on until the lowest cost per hour is found. The number of years that will produce the lowest hourly cost will be the number of years the tractor can be operated economically.

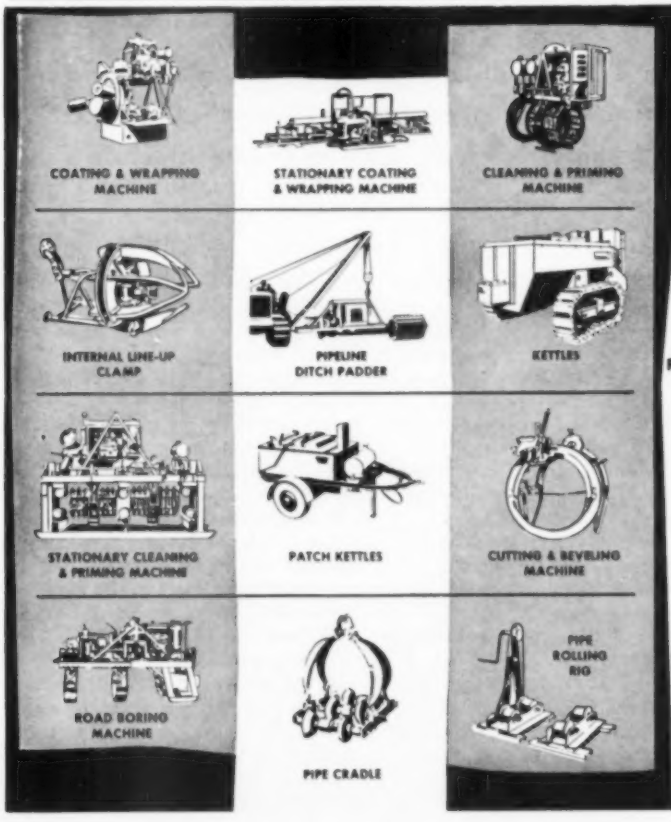
The accompanying charts show how these rates are figured. In making these charts, Caterpillar used an average-sized machine, costing about $20,000, and assumed it would work 1800 hours each year of the first three years, and 1500 hours each year thereafter. In this example, the lowest hourly rate occurred at the end of the third year. The 11 cents difference between the third and fourth years appears to be small, and many owners wonder why they should replace on such a small basis.

It must be understood that if the tractor was originally set up to operate for three years, the charge per hour for the fourth year would then be $4.25. The actual difference in dollars between the third and fourth year operation would be $759 (or 6900 hours at 11 cents per hour).

Work Sheet for Determining Economic Life of Track-Type Tractors.

	YEARS									
	1	2	3	4	5	6	7	8	9	10
Hours Operated Each Year	1800	1800	1800	1500	1500	1500	1500	1500	1500	1500
Total Hours at End of Year	1800	3600	5400	6900	8400	9900	11400	12900	14400	15900
Major Components	Repair and Overhaul Cost Per Hour									
Engine	0	0	0	.12	.12	.12	.12	.23	.23	.23
Steering clutches	0	0	.09	.09	.09	.09	.09	.09	.09	.09
Brakes	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
Tracks	0	.62	.62	.62	.62	.62	.62	.62	.62	.62
Cable control	0	.03	.03	.07	.07	.06	.06	.07	.07	.07
Roller frame & sprocket group	0	0	.38	.38	.38	.38	.49	.49	.49	.55
Master clutch	0	0	0	0	0	0	.06	.06	.06	.06
End bits & cutting edges	.08	.08	.08	.08	.08	.08	.08	.08	.08	.08
Transmission & final drives	0	0	0	.14	.14	.14	.14	.29	.29	.29
Guards, hoods, fenders	0	.09	.09	.18	.18	.18	.18	.18	.18	.18
TOTAL REPAIR & OVERHAUL COST/HR.	.15	.89	1.36	1.75	1.75	1.74	1.91	2.18	2.18	2.24
Productivity cost per hour	0	.20	.40	.60	.80	1.00	1.20	1.40	1.60	1.80
Unavailability cost per hour	.40	.50	.70	1.10	1.40	1.70	1.80	1.90	2.00	2.00
Capital decline cost per hour	4.22	1.55	.89	.80	.27	.27	0	0	0	0
TOTAL COST PER HOUR*	4.77	3.14	3.35	4.25	4.22	4.71	4.91	5.48	5.78	6.04
Average hourly cost if tractor is replaced at end of given year	4.77	3.95	3.75	3.86	3.93	4.04	4.16	4.31	4.46	4.61

*Excluding operator, fuel, grease, etc.



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The draftsman's mind is not limited by the flat surface of his drawing board: he must visualize all dimensions in drawing a line.

Portrait of a DRAFTSMAN

P 605.

— *Photos and data courtesy Northern Natural News.*

He's the middleman between engineer and contractor who provides the "how" of doing a job through the medium of precise blueprints

SENIOR draftsman Bill Wees and his 34 colleagues in the drafting department of Northern Natural Gas Company have adequately summed up the primary purpose of their job: *The task of reducing things to their simplest terms.*

Regardless of what the job is or how big it is — whether it be the addition of a compressor unit at a compressor station, construction of a town border station, or laying a new 30-in. pipe line — the goal of the draftsman is the same: To solve the problems involved and spell out the answers in the simplest terms possible for men he will probably never see.

The draftsman knows that the contractor at a station 800 miles away cannot turn and say, "Now, exactly what did you mean here?"

In the precise lines and legible lettering on the blueprint must be all the answers to any question that a contractor might ask.

At Northern Natural, as in the drafting departments of pipe line companies everywhere, the draftsmen are concerned with the "how" of things. A company's marketing department may get requests for additional volumes of gas for customers and provide the "why" of added compressor and pipe line facilities. The engineers will study the best means of providing added capacity and specify the type of compressor units and size of pipe needed and provide the answer to the "what."

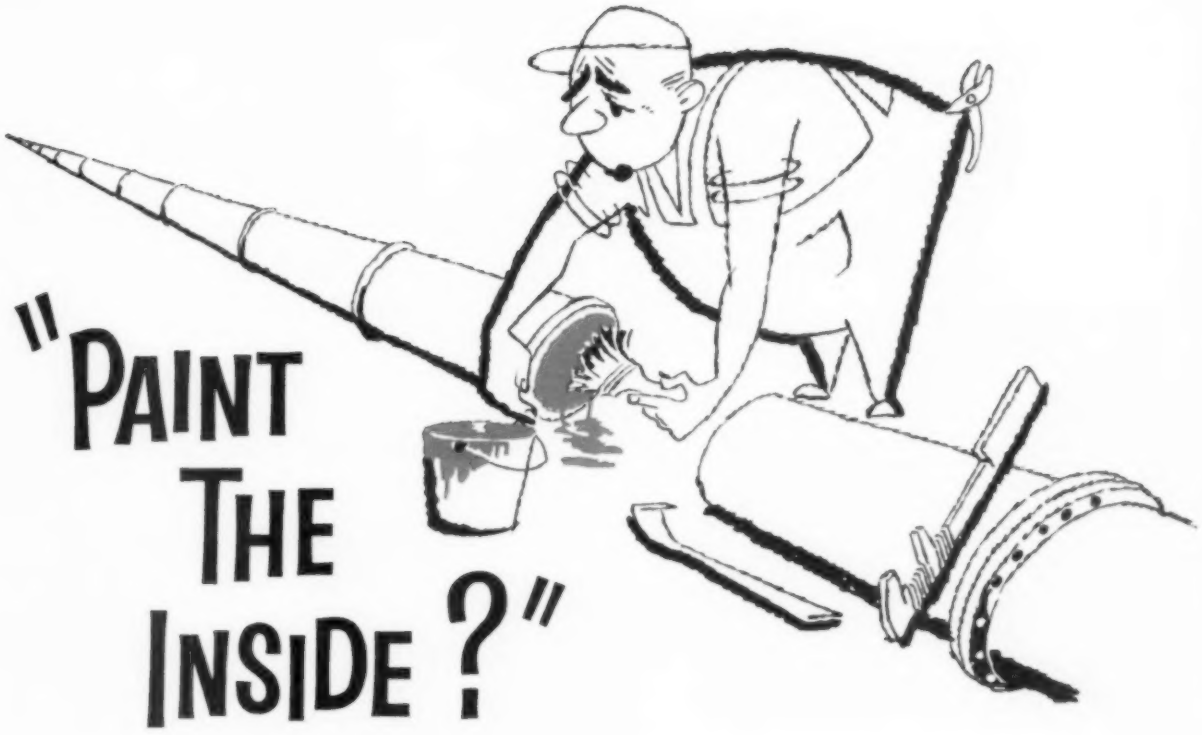
But it is up to the draftsman to find "how" it will be done.

At Northern Natural, it works this way: If a compressor unit is to be added, the problem first comes to chief draftsman Virg Glasford and his assistant, Jim Jensen. Blueprints and specifications to be added will go to one of the eight squad leaders, of which Bill Wees is one.

Many problems must be answered. The compressor building must be extended to give additional space, service lines carrying fuel, jacket cooling water, and the like are required, and yard piping modified.

Bill, as squad leader, lays out the work for the three men in his squad and decides how many drawings will be needed to give the contractor all the necessary information. As Bill and his men bend over their drafting tables, they know that the most convenient way is not always the right way; economy is important, too.

If you have ever sat before a blank sheet of paper and searched for words to put into a letter, you have probably experienced some of the feeling of a draftsman when he faces a blank sheet of vellum paper on his drawing board



"PAINT THE INSIDE ?"

Sure you can "paint" the inside of your pipe line, but you don't need a brush (or a scraper) with UNICOR®.

UNICOR, UOP's oil-soluble corrosion inhibitor, added at a concentration as low as 10 ppm., will in effect make a rust-preventive oil of your product.

This makes UNICOR economical, providing vital protection for your pipe line at an inhibitor cost of about $0.0005 per barrel. UNICOR will scour your pipe line and coat it with a film that repels moisture and sludge.

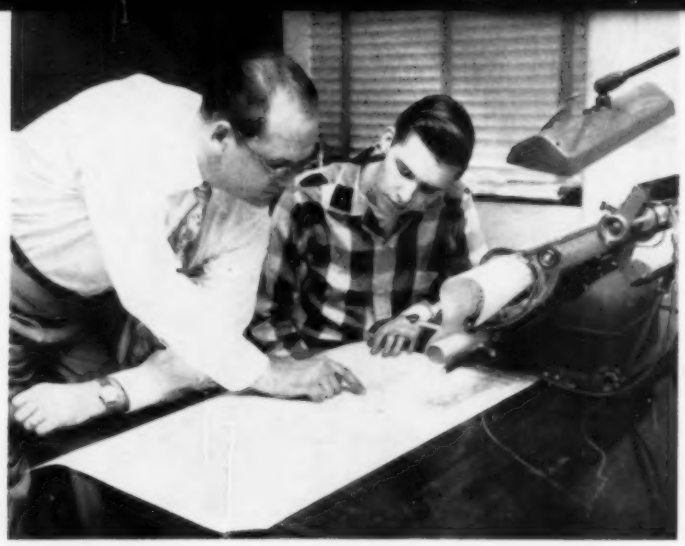
Economies which result from reduced scraper and filter maintenance will more than pay for the inhibitor. This means that you actually get free protection for your pipe line.

Our experienced technologists will be glad to assist you in the design, installation and operation of a UNICOR system of protection. Write us for complete information and samples.

PRODUCTS DEPARTMENT

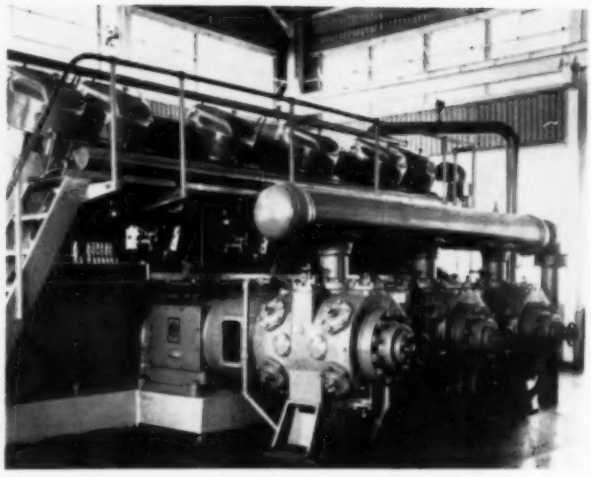
UNIVERSAL OIL PRODUCTS COMPANY

30 ALGONQUIN ROAD
DES PLAINES, ILLINOIS, U S. A.



Varitype operator Bill Nielsen gets instructions from Bill Wees before completing lettering on drawing. Varitype not only saves time but adds to legibility of prints.

Draftsman may never see the giant compressor installed — except on his drafting board. It may take as many as 100 drawings to show the installation of such a unit.



Before a drawing can be made, it is often necessary to check back through voluminous files of previous prints for vital information.

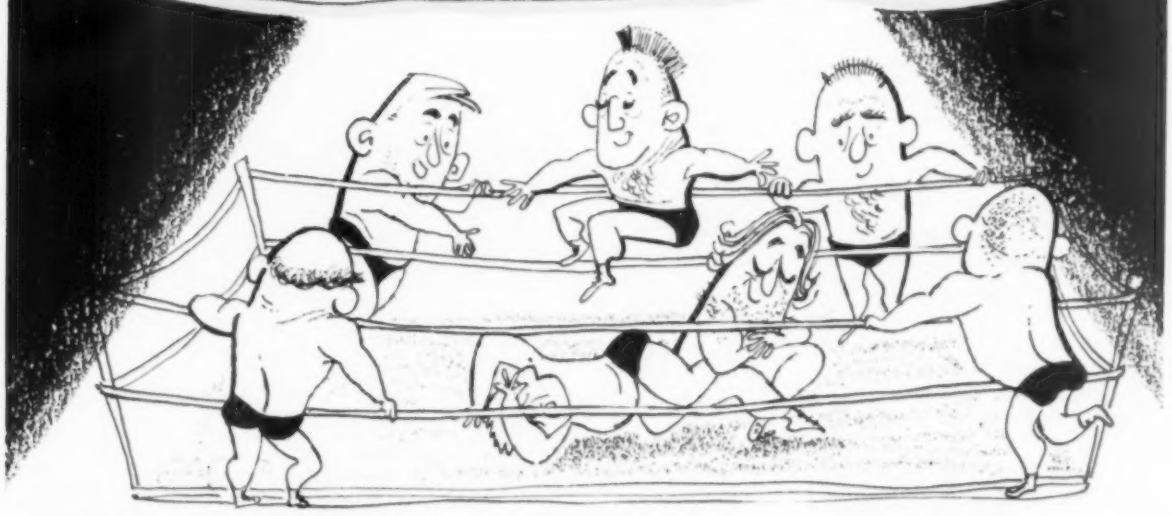
and prepares to put down the first line that will take him into an intricate drawing.

The tools with which the draftsman puts down this line and succeeding lines and angles are precision instruments and receive the finest care. They must be amazingly accurate because, to the draftsman, there is nothing "almost" correct — he does not rely upon the deceiving eye or shaky hand to obtain accuracy. With the aid of these drafting tools, scales, and angles, the preliminary print is completed in pencil. Final drawings are finished in India ink and lettering is done with a Varitype machine, which gives clean and legible lettering.

At Northern — as with most companies — the word blueprint is actually a misnomer. Northern's prints are reproduced on an Ozalid machine that gives blue lines on white paper, instead of the conventional white on blue.

Working far in advance of actual

BATTLE ROYAL against CORROSION



MIDWESTERN'S stable of Corrosion fighters

Midwestern's leadership in the field of pipeline corrosion control is the result of aggressive service practices, together with the most improved materials available . . . KAPCO Rock Shield — for pipe protection in rocky areas . . . GLASFAB Hot or Cold Dope Wrap — for emergency pipe line repairs . . . Owens-Corning Fiberglas CORO-MAT — for reinforcing enamel for lifetime protection of underground pipe . . . GLAS-KOTE handy tape for pipeline joint and fitting wrapping . . . KERMAC Pipeline Outerwrap — for greater strength and porosity, fewer breaks and "holidays" . . . KEYSTONE Asbestos Felt — for high impact and soil acid resistance.

There's a Midwestern representative within a few hours of your pipeline requirements . . . wherever they are.

MIDWESTERN PIPE LINE PRODUCTS COMPANY

P. O. 1886, Tulsa, Oklahoma • Hickory 6-6144

HOUSTON, TEXAS	ATLANTA, GEORGIA	MT. PROSPECT, ILL.	PITTSBURGH, PA.	OKLAHOMA CITY, OKLA.	PORTLAND, ORE.
#1 Briar Dale Ct.	3131 Maple Drive	Box 225	1125 Park Bldg.	15 S. W. 29th St.	901 N.W. 11th St.
Mohawk 7-2493	Exchange 1335	Clearbrook 3-4439	Express 1-3952	Central 2-2527	Capitol 7-3747

FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD

Squad leaders Ed Hustak, Glenn Hymer, Charles Hawkins, and Bill Wees gather around Chief Draftsman Virg Glasford for advice on tackling a problem.

Northern Natural's assistant chief draftsman Jim Jensen, left, meets often with squad leaders to discuss progress on a project.

Finished drawings from Bill's squad go to print machine operator Dick Hand, who makes the required number of prints.

Close teamwork is needed in a drafting squad such as Bill's. In the group, (l-r), are Bob Nielsen, Don Hanna, and Howard Minor.

construction, the drafting section first completes a set of prints to be used in soliciting bids. These prints are likely to be less detailed than the final set, which will be stamped "Approved for Construction."

Northern Natural, in most cases, buys the material to be used in construction and the draftsman must itemize the materials to be used. Teamwork is important as the drafting of prints continues. Bill Wees and the other squad leaders meet with Virg and Jim to get advice, dig into records for procedures, and kick problems around among themselves.

Although each squad leader and his squad may devote more time to one phase of operations such as compressor stations, pipe line construction, or town border stations, because of natural ability along that line, all squads are capable of handling any work that may confront the section.

The jobs that pass through a drafting department are many and varied.

Practically every department of a company at one time or another has need of charts, graphs, and drawings. They come with rough sketches and rely upon the imagination of the draftsmen to get the required result.

Imagination is prime requisite of a good draftsman as well as skill in lettering and a highly developed mechanical ability.

Although Bill Wees, after completing a set of blueprints marked "Approved for Construction," may never see the finished project, he finds a great deal of satisfaction in his work.

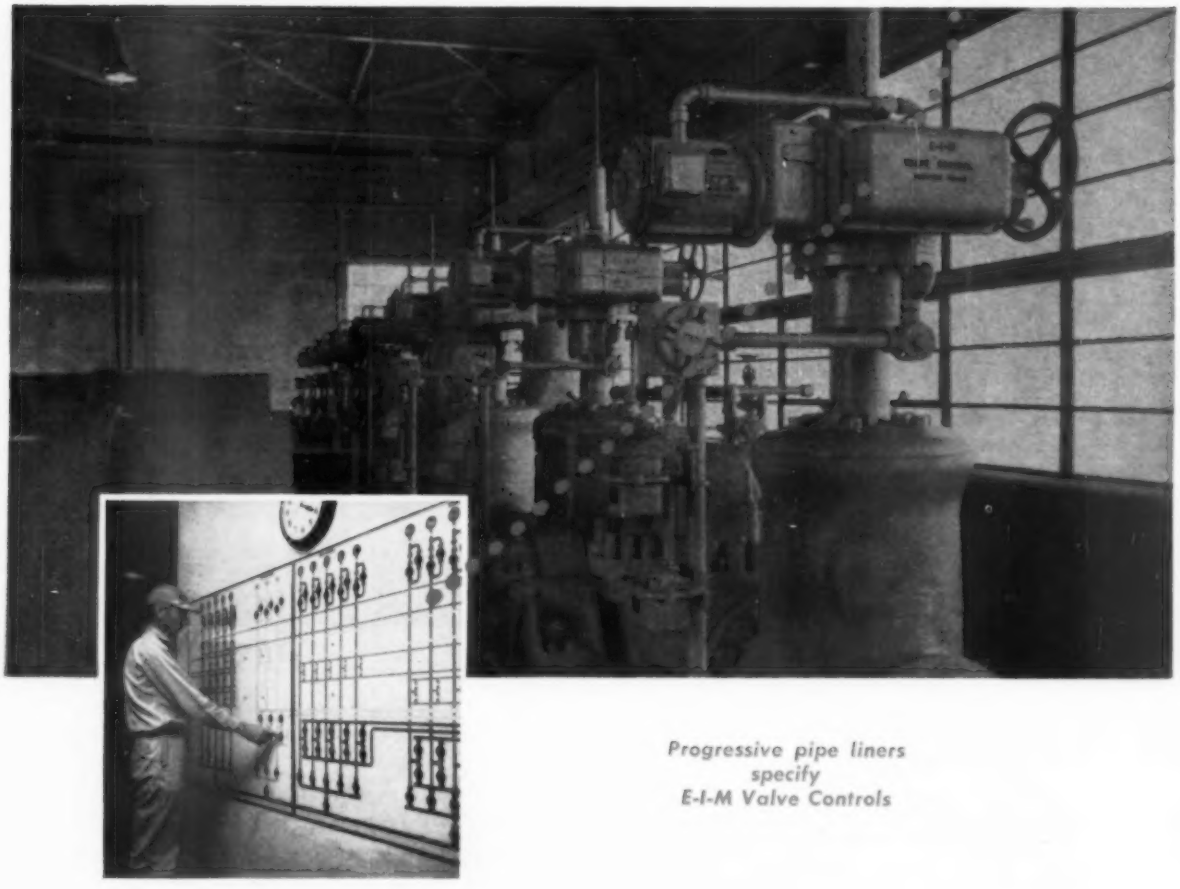
He does not need to see the compressor unit humming along in a distant station to add to his feeling of accomplishment. For Bill, like most draftsmen, the sense of accomplishment was achieved when he stepped back from a finished drawing and felt he had the right answer to a problem.

★ ★ ★

General view of drafting department, where Northern Natural has 35 men at work.

EFFICIENT, INSTANTANEOUS MOVEMENT

West Texas Gulf Pipe Line Co., like many outstanding transmission lines, makes E-I-M Valve Controls the heart of the modern pumping station — striking a single push-button automatically opens the station block-valve and in sequence the pump suction-valve, pump motor, pump discharge-valve



Progressive pipe liners specify E-I-M Valve Controls

E-I-M Company INCORPORATED

1340 OLD SPANISH TRAIL • HOUSTON 25, TEXAS • MOhawk 4587

Valve Controls • Speed Reducers • Cooling Tower Drives • Control Valves

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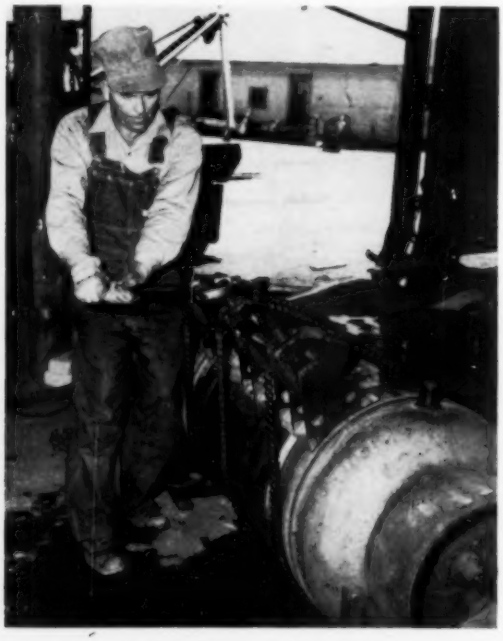
IDEAS AT WORK
IN PIPELINING

Your Ideas Are Worth Money

If you have an operating idea or have devised a piece of equipment to do a job easier or cheaper, send it to us with a photo or drawing (we fix up rough sketches) . . . we will pay $10 for each idea used.



Full Encirclement Sleeves

Bob Puckett, beveler, Tulsa shops, of Service Pipe Line Company, is shown here installing the top half of a full encirclement sleeve, which is used in "big inch" pipe. The sleeve and clamping devices were developed by the company to facilitate crews making repairs on any leaks other than wide-open splits.

This is the first test that has been made on holding equipment for the full encirclement sleeves.

Using half of a full-encirclement sleeve will enable three men to stop a leak in about an hour (not counting excavation time), saving time and hard work. (Material used by permission Service's magazine, *The Connecting Rod.*)

Store Chains Beneath the Warehouse Floor

Build a bin beneath the warehouse floor for storing chain, and save storage space. The bin can be made of wood or metal and should be divided into as many compartments as sizes of chain to be stored.

Bore a hole through the floor for each size chain, and catch the side of each chain with a tee-hook made of welding rod. Notch each side of the holes so the tee-hooks are beneath the floor.

To start measuring off chain, lift up on the tee-hook and you are in business.

Triangular Brace Aids in Pulling Pistons On 'V' Type Engines

A triangular lifting piece made of ¾-in. steel plate makes an excellent tool for pulling pistons on "V" type engines. The cylinders are set at an angle and any vertical pull forces the piston against the cylinder wall. But the eccentric triangular tool tends to make the piston hang in the direction of the cylinder.

After the cylinder head has been removed, simply bolt the tool to the top of the piston and hook the chain hoist into the apex of the triangle. Then as the piston is raised, advance the chain hoist away from the engine.

Canadian News Notes

Competition for Savanna Creek Gas. A major blow-up in plans for pipelining gas from the big Savanna Creek field of southwestern Alberta, in the Rocky Mountain east range, has occurred with the introduction of completion for the proposal of Westcoast Transmission Company, to build a pipeline southwest to northern Idaho. Northern Natural Gas Company, which holds 32½ percent of the field, intends to apply to the FPC for permission to build its own line to Minneapolis to serve its own existing system.

Westcoast recently signed a contract with Phillips Petroleum Company, which holds 27½ percent interest. Still to be dealt with is Husky Oil & Refining, Ltd., which has 32½ percent and has not signed with anyone. Northern itself has the entire interest in an old contract for delivery of gas into Minnesota by Trans-Canada Pipe Lines, Ltd. This is a further complicating factor in both the Savanna Creek operation and the export of gas proposed by Trans-Canada to Midwestern Transmission Company. It is generally believed that a three-way agreement will have to be worked out for a settlement of both proposals.

Trans-Canada Operations Resumed. River crossing operations are being resumed on the two main river sections of the 34-in. natural gas pipeline of Trans-Canada Pipe Lines, Ltd., in Manitoba. The first section of the twin crossing in each case was pulled in December, but cold weather forced suspension of the second loops.

At Miniota the final tie-in weld on the first crossing was made on February 6, and the crew began ditching for the second loop the same day. At Portage la Prairie the first loop was tied in on December 16, but the crew could not start work again until early in February.

Scheduled completion date for both jobs is before the end of March, as danger from spring break-up of ice occurs in the early spring. Both crossings are on the Assiniboine River, which goes into flood stage at any time after early April. There would be a serious risk of losing the section if it got caught in rising water before backfill was completed.

The construction job is under contract to Marine Pipeline & Dredging, Ltd., of Vancouver, under direction of general superintendent Ed Stanley.

Westspur at Capacity. Westspur Pipe Line Company is now running at about capacity of its 109-mile 12-in. crude line in southeastern Saskatchewan. January deliveries to the Interprovincial pumping station at Cromer, Manitoba, amounted to 1,241,000 bbl, or an average of more than 40,000 bbl per day. Capacity is rated at 42,000 bbl per day with present equipment. At the beginning of January there were 238 tank batteries and 44 pumping wells connected to the system. All terminals are operating satisfactorily. There are four, at Midale, Steelman, Frobisher, and Alida, serving the principal fields in the region.

Westspur has 216.96 miles of main line and gathering system lines in the ground, of which 107 miles are gathering lines. The 1957 construction program includes a proposed 16-in. loop of 75.27 miles, and additional gathering lines for which application for a permit has been made to the Board of Transport Commissioners, the case to be heard on March 4. The main line proposal is not yet complete and will be applied for later.

No CONTAMINANTS in this

GAS TRANSMISSION LINE

The development of the Aerotec Dry Gas Scrubber several years ago provided the First Scrubber to assure clean gas with no carry-over of liquids or solids.

Multiple small-diameter cyclone tubes create a high centrifugal force, resulting in the removal of solids and liquids without the use of wetting agents. The result is a dry, clean product.

This principle assures high efficiency, and continuous discharge of contaminants with no pressure build-up.

Since the installation of the first Aerotec Scrubber, a continuous program of research and development has produced several new and outstanding design and applications of this principle. Our Project Engineers, with years of experience in this field, will be glad to help you in working out your problems. Why not contact them today?

Project Engineers **THE THERMIX CORPORATION** Greenwich, Conn.
(Offices in 38 principal cities)
Canadian Affiliates: T. C. CHOWN, LTD., 1440 S. Catherine St. W., Montreal, Que.

Manufacturers
THE AEROTEC CORPORATION
Greenwich, Conn.

FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD D-65

for cooling tower application...

There's MORE protection against humidity in Allis-Chalmers MOTORS

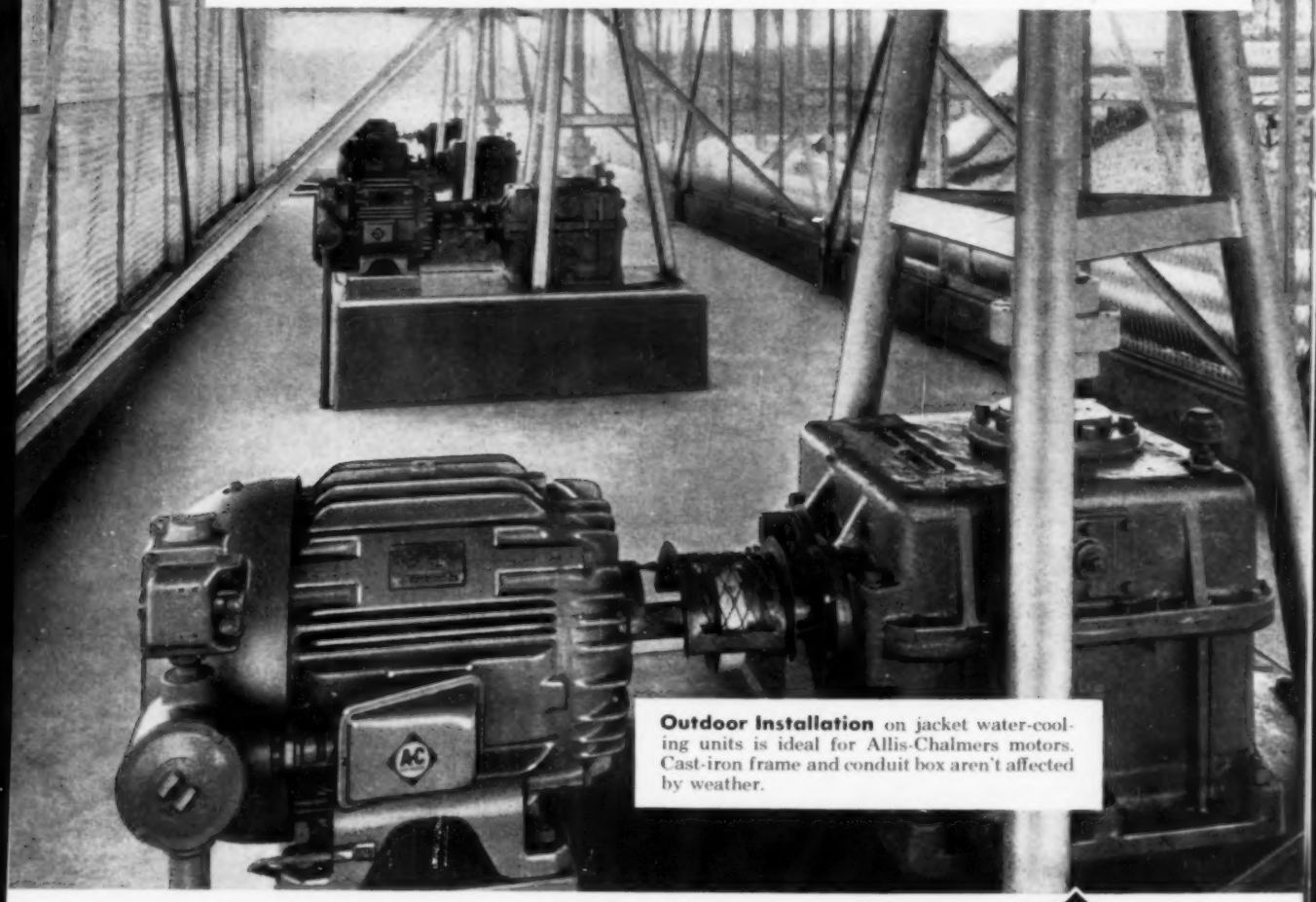
The ultimate in protection against high humidity — major cause of cooling tower motor failure — is provided tower builders and users in Allis-Chalmers TEFC motors. Here's why:

1. **Moisture drainage** — Drain plug can be removed to eliminate condensed moisture in the motor. (Particularly helpful in intermittent operations where condensation is more likely.)

2. **Extra-insulated stator** — Several applications of special insulating varnish plus repeated baking keep humidity out . . . give the long electrical life you need.

3. **Weather-protected bearings** — Rotating seal, turning in close running clearances, guards against entry of water.

Find out more about the "MORE" in Allis-Chalmers motors by contacting your nearby A-C sales office or distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wis.



Outdoor Installation on jacket water-cooling units is ideal for Allis-Chalmers motors. Cast-iron frame and conduit box aren't affected by weather.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5183

Westcoast to Spend an Additional $100,000,000

Westcoast Transmission Company, Ltd., announces a $100,000,000 expansion program that will double the volume of natural gas exported to the United States and will include a new pipeline serving the Inland Empire from Southern Alberta gas fields.

In making the announcement from Calgary, Frank McMahon, president of Westcoast, said:

"The expansion program is in addition to our present $170,000,000 natural gas pipeline project now under construction, and will result in one of the most important industrial projects in the West."

The new Westcoast program is divided into two phases:

1. An additional $55,000,000 will be spent to enlarge the Westcoast main line in British Columbia, presently under construction. This will mean additional compressor stations and other facilities, which will raise the capacity of the line from the presently planned 400,000,000 cu ft per day to 660,000,000, cu ft per day. Westcoast has contracted to supply an additional 350,000,000 cu ft of gas per day for export to Pacific Northwest Pipeline Corporation. Previous contracts were for 300,000,000 cu ft per day.

2. The remaining $45,000,000 is planned for a 500-ton-a-day sulfur plant and a 174-mile, 30-in. pipeline stretching from the large, newly discovered gas field at Savanna Creek in southwestern Alberta. Gas in this field, owned by Phillips Petroleum, has been contracted to Westcoast for this line. Contract calls for the delivery of 125,000,000 cu ft on a peak day. This line will provide service for a number of towns in southwestern Alberta and southeastern British Columbia. The bulk of this gas will be exported to Pacific Northwest Pipeline Corporation at Kingsgate.

Transcontinental Given Permit for Gulf Line

Transcontinental Gas Pipe Line Corporation has been authorized by the Federal Power Commission to lay a 28.5-mile pipeline into the Gulf of Mexico. The line, which will be of 16-in. pipe, will connect the company's system wth a new producing gas field 7.5 miles off the Louisiana coast. The area to be served has eight producing wells with total proved reserves of 88 billion cu ft.

The proposed line will have a rated capacity of 110,000,000 cu ft a day, but initial deliveries will be less than one-third this volume, according to Transcontinental.

Improvements on a Proven Product...
WmSON CONCENTRIC-SUPPORT INSULATOR
it's new... NON-CONDUCTIVE KEY BLOCK
it's new... PLASTIC COVERED HIGH-TENSILE CABLE
NON-CONDUCTIVE RUNNERS
High Compressive strength
THE ECONOMICAL INSULATOR...
FOR SMALL AND INTERMEDIATE SIZE PIPELINES
• CENTERS PIPE IN CASING
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REPRESENTATIVES: HOUSTON • AMARILLO • PITTSBURGH • PLAINFIELD, N. J. • JOLIET, ILL. • JACKSON, MICH. • LOS ANGELES • SAN FRANCISCO • BARTLESVILLE, OKLA. • SEATTLE • EDMONTON • TORONTO • CALGARY • VANCOUVER • BUENOS AIRES • CABIMAS, ZULIA, VENEZUELA • DURBAN, NATAL, SOUTH AFRICA • PARIS, FRANCE

FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD D-67

WHAT WILL YOUR PIPE LINES LOOK LIKE 10 YEARS FROM NOW ?

In case after case, lines protected with TAPECOAT have been dug up after more than 10 years of service *with no signs of deterioration on the pipe surfaces uncovered.* That's why TAPECOAT coal tar coating is specified by those who realize that continuing protection is the *first* consideration.

Since 1941, this quality coal tar coating in handy tape form has demonstrated its ability to withstand corrosion year after year, above and below ground, on pipe, pipe joints, couplings and other vulnerable surfaces.

Why gamble with "unknown" protection? By using TAPECOAT, you'll be sure to have the quality protection you need for long service life without costly maintenance and replacement.

Write for brochure and prices

The TAPECOAT® Company

Originators of Coal Tar Coating in Tape Form

1533 Lyons Street
Evanston, Illinois

PipeLine Projects

Utah to California Pipeline Planned

The Four-Corners Pipe Line Company has been established to construct a 600-mile crude oil line starting at the Four-Corners area of Utah and terminating at Los Angeles, California.

Organization of the new firm, announced in Houston, Texas, by six participating companies, is a crystallization of plans first announced by Shell Oil Company and Standard Oil Company of California in October, 1956. The following firms hold stock in the new company: Continental Pipe Line Company (10 percent); Gulf Oil Corporation (20 percent); Richfield Oil Corporation (10 percent); Shell Oil Company (25 percent); Standard Oil Company of California (25 percent), and The Superior Oil Company (10 percent).

R. G. McIntyre was elected president of the company. He retired January 31 as chairman of the board of Standard Oil Company of Texas and as president of the Pasotex Pipe Line Company.

The new line, to cost an estimated $50,000,000, will have an initial capacity of 60,000 bbl per day, McIntyre said. Ultimately, capacity could be increased to 160,000 bbl per day by increasing the number of pump stations along the route, he added.

Shell Pipe Line Corporation, which will construct and operate the line as agent for the company, has completed much of the preliminary engineering work and construction will begin with initial delivery of pipe in April of this year. It is expected that crude shipments out of the Four-Corners area can be started by the end of 1957.

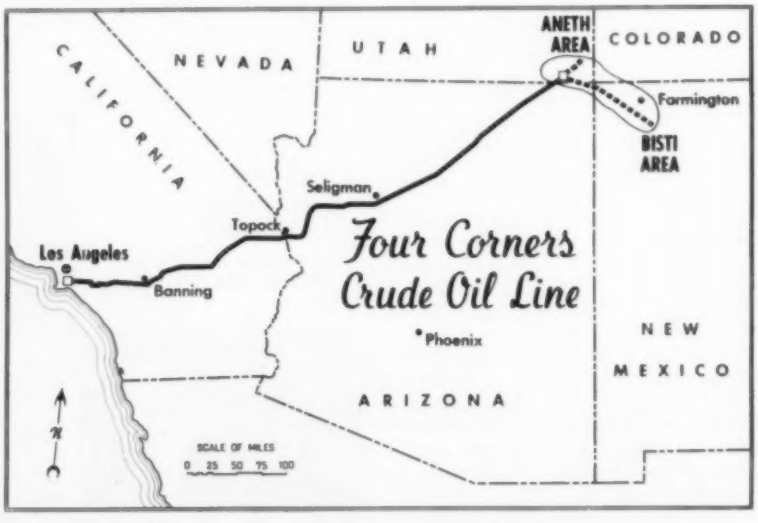
McIntyre's announcement said further: "Westward movement of Four-Corners oil is both logical and essential because of California's ever-increasing requirements for crude and the proximity of Los Angeles refineries, which are 400 miles closer to the Four-Corners area than are the major U. S. Gulf Coast refineries. We feel that this line will provide a real service by establishing another source of crude oil for the Pacific Coast's expanding economy, while stimulating development of what promises to be a major producing area."

The complete Four-Corners crude oil line system will total some 750 miles, including 12 and 8-in. feeder lines to the Aneth and other fields in Utah, and the Bisti field in New Mexico.

The 16-in. main trunk line will originate on the Navajo Indian Reservation in the southeast corner of Utah and terminate at Los Angeles refineries.

Transcontinental Adds to North Carolina Facilities

The Federal Power Commission has authorized Transcontinental Gas Pipe Line Corporation to construct and operate facilities to increase deliveries of natural gas to the city of Shelby, North Carolina. Construction consists of an additional 2500 hp at Transcontinental's mainline compressor station No. 6 in southeastern Louisiana and the addition of 2500 hp to its mainline compressor station No. 8 in southern Mississippi. The cost of the proposed construction is estimated at $1,375,000.



Southern Natural Applies For Louisiana Additions

An application by Southern Natural Gas Company for the construction and operation of facilities in Louisiana has been accepted for filing by the Federal Power Commission.

Southern Natural proposes to construct about 10.5 miles of 8⅝-in. pipeline, including a submarine crossing of the Mississippi River; two measuring stations, and to install two 660-hp compressor units at the Taca compressor station, one 550-hp compressor at the White Castle compressor station, and one 1350-hp compressor unit at the Gwinville compressor station.

Permit Granted for Louisiana Gas Line

The Federal Power Commission has authorized the construction of gas transmission facilities in Louisiana by Texas Gas Transmission Corporation at an estimated cost of $1,459,000.

Facilities include 13 miles of 20-in. line extending from the end of its East Lake Palourde 20-in. line in Assumption Parish to the Thibodaux area, Lafourche Parish, together with a gas purchase meter station in the Thibodaux area. In October, 1956, the FPC granted Texas Gas temporary authorization to construct and operate these facilities.

Colorado Interstate Construction Approved

The Federal Power Commission has authorized Colorado Interstate Gas Company to construct and operate three new meter stations, one at Hampden Avenue in South Denver, one 3.1 miles east of the existing station for North Pueblo, and one at South Pueblo; 9.25 miles of 26-in. loop line from the East Denver control station to the new Hampden Avenue station; and 26.4 miles of 8-in. pipeline looping the Portland, Colorado, lateral serving the Portland-Florence-Canon City area.

In September, 1956, the FPC granted Colorado Interstate temporary authority to construct and operate the 35.65 miles of pipeline.

Short Line Needed to Maintain Gas Pressure

Texas Illinois Natural Gas Pipeline Company is seeking authorization to construct natural gas facilities in Illinois at an estimated cost of $1,700,000, the Federal Power Commission announces. Texas Illinois proposes to construct approximately 9.55 miles of 36-in. transmission line, looping its existing single 30-in. line from a point on the north bank of the Illinois River to its Joliet regulator station, serving the Chicago area.

The applicant said the proposed looping is necessary for the maintenance of adequate pressure on its system north of the Illinois River to enable it to deliver the quantities of gas required at the Joliet meter station delivery point and at delivery points on its Volo lateral in the Chicago area.

FPC Refuses Rehearing On Gas Line Order

The Federal Power Commission has denied applications for rehearing or for stay of its opinion issued last December 4 authorizing Natural Gas Pipeline Company of America to construct a 350-mile line to connect wells in northern Texas and southwestern Oklahoma and to purchase natural gas for transportation and ultimate delivery to the Chicago area.

The FPC's opinion and order also issued a certificate to Lone Star authorizing it to sell a maximum of 100,000,000 cu ft of gas a day to Natural in Stevens County, although it denied Lone Star's proposal to build a 230-mile line to make this gas available to Natural at Fritch, Texas.

The applications for rehearing and for stay and other relief were filed by Lone Star Gas Company, of Dallas, Texas, Oklahoma Natural Gas Company, of Tulsa, Oklahoma, and Consolidated Gas Utilities Corporation, of Oklahoma City, Oklahoma.

In denying the requests, the FPC concluded that "no new facts and no principles of law have been set forth which were not considered by the commission when it adopted opinion No. 299 and accompanying order; or which having now been considered, warrant any change in or modification of the said opinion and order."

Tennessee Gets Permit For 162 Miles of Line

Tennessee Gas Transmission Company has been authorized to construct 99 miles of 26-in. mainline loop in Ohio and Pennsylvania; 63 miles of 30-in. mainline loop in Kentucky, and the addition of 13,940 compressor hp at stations in Massachusetts, Louisiana, Mississippi, and Tennessee. The additional facilities, the company's application said, would enable it to increase its deliveries to certain existing customers by a total maximum of 89,005,000 cu ft per day. In addition, Tennessee would sell about 25,511,000 cu ft per day of peaking service gas to certain existing customers during the 1956-57 heating season.

In June, the FPC granted Tennessee temporary authorization to construct the facilities and on November 21 temporarily authorized their operation during the 1956-57 heating season. The estimated cost of the facilities is approximately $20,337,940, plus gathering facilities to cost an estimated additional $10,061,563.

Do you keep your fingers crossed?

— every time you start one of your gas engine driven compressors? Many a starting air piping system has been blown into shrapnel by a lubricating oil vapor explosion. The possibility of this can be obviated by installing a Campbell Centrimpact separator. Price, $300.00, f.o.b. Long Beach, California. This is not a filter but a combination of centrifugal and impact design which throws out the finest mist particles and isolates them from the flow. We can state without fear of contradiction that CENTRIMPACT IS THE MOST EFFICIENT MIST EXTRACTOR EVER BUILT.

Send for our paper on "Explosions in Starting Air Piping Systems."

CAMPBELL CENTRIMPACT

J. A. CAMPBELL COMPANY

Development and Manufacturing Engineers

645 E. Wardlow Road, LONG BEACH 7, Calif. GArfield 4-5092

What happens to pipe wrap underground?

Here's what a federal agency found out*. . .

Many wrap and enamel combinations were imbedded in a test tank filled with bentonite clay slurry. Extreme soil stresses were imposed on these samples by alternate wetting and drying cycles. Resistance to backfill puncture was also checked after each cycle. Holiday-detection tests showed that the glass fiber and coal-tar combination stood up through the full 25 cycles of the test.

*As reported in Journal American Water Works Association, Vol. 48, Feb., 1956. Photo courtesy U.S. Bureau Of Reclamation.

These impartial tests show why BLUE FLAG gives you complete pipeline protection

It was conclusively demonstrated that glass fiber mat like Blue Flag, with coal-tar enamel, provides effective protection against *both* soil-stress and backfill-puncture action. (See picture caption above for actual test conditions.)

This is the kind of protection you need for maximum service life. Yet it's yours for only ½ of 1% of initial pipeline cost when you use L·O·F Glass Fibers' Blue Flag.

No wonder glass fiber reinforcement like Blue Flag Pipe Wrap is preferred. It strengthens enamel . . . assures coating essentially free of holidays. And, Blue Flag helps speed application—its high tensile strength virtually eliminates breakage in the wrapping operation.

Yard-wrapped, or applied over-the-ditch, Blue Flag can be the answer to your pipeline protection problems. It's available from conveniently located distributor warehouses. For the address of the one nearest you, or for technical information, write: *L·O·F Glass Fibers Company, Dept. 72-37, 1810 Madison Avenue, Toledo 1, Ohio.*

L·O·F GLASS FIBERS

L·O·F GLASS FIBERS COMPANY • TOLEDO 1, OHIO

WITH THE PIPELINE CONTRACTORS

● **Fulton Banister, Ltd., 625 Northern Hardware Building, Edmonton, Alberta.** Has 33 miles of 24-in. for *Interprovincial Pipe Line Company* between Peebles and Glenavon, Saskatchewan, to begin construction about June 1. Also has about 130 miles of 1 to 20-in. distribution lines in Regina City, Saskatchewan, for *Saskatchewan Power Corporation.*

● **Mannix, Ltd., 322 Seventh Avenue W., Calgary, Alberta.** Has 100 miles of 3 to 12-in. gathering line in the Pembina field to lay for *Pembina Pipeline Company, Ltd.* Has 110 miles of 30 in. for *Westcoast Transmission Company, Ltd.*, between Huntington and Kingsvalle, British Columbia. Has 90 miles of 34-in. to lay for *Trans-Canada Pipe Line Company* between Moose Jaw and Candiac, Saskatchewan. Has contract to lay 32 miles of 16-in. loop for *Pembina Pipe Line Company, Ltd.*, between Edmonton and Calmar, Alberta. Work on this project is to begin May 1.

● **Price-Poole Pipeline Constructors of Canada (joint venture of H. C. Price of Canada Limited and Poole Construction Company, Ltd., Rivers, Manitoba.** Has 99-mile section of 34-in. pipe to lay for *Trans-Canada Pipe Line Company* on a section of line in Manitoba Province extending eastward from the Assiniboine River near Miniota. Right of way has been cleared and limited activity is underway prior to actual construction beginning this spring as weather permits.

● **Dunn Bros., Inc., 801 Mercantile Securities Building, P. O. Box 5771, Dallas, Texas.** Has 105 miles of 34-in. for *El Paso Natural Gas Company* between St. Michaels and Navajo Station, Arizona. Has 145 miles of 34-in. line for *Western Pipe Line Company* east of Flagstaff to Topock, Arizona.

● **O. R. Burden Construction Corporation, P. O. Box 5216, Tulsa, Oklahoma.** Has 8 miles of 20-in. to take up in the vicinity of Roland, Arkansas, for *Magnolia Pipeline Company.* Has completed laying a similar amount of new line paralleling take-up job. Began a two-mile, 12 and 16-in. line in West Tulsa, Oklahoma, for *Great Lakes Pipe Line Company* on February 1.

● **Dutton-Williams Bros., Ltd., North Canadian Oils Building, Calgary, Alberta.** Has 320 miles of 10 through 4-in. distribution systems for *Inland Natural Gas Company* in Nelson, Savona, and Penticton, central British Columbia.

● **R. H. Fulton & Company, Inc., P. O. Box 1526, Lubbock, Texas.** Has 252 miles of 22-in. line for *Colorado Interstate Gas Company* between Rock Springs and Laramie, Wyoming. Has 78.4 miles of 26-in. line in the Minnesota section of *Interprovincial Pipe Line Company's* main line loop.

● **Engineers Limited Pipeline Company, 200 Bush Street, San Francisco, California.** Has line for *Pacific Gas & Electric Company* consisting of 37 miles of 20-in., 37 miles of 18-in., and 9 miles of 12-in. to lay from Beehive Bend field to Sacramento, California.

● **River Construction Corporation, Box 9217, Fort Worth, Texas.** Has 84 miles of 8 and 10-in. line from Richmond to Stockton, California, to lay this spring for Southern Pacific Pipe Lines, Inc.

● **Lone Star Constructors, 10301 Shady Trail, Dallas, Texas.** Has 94 miles of 18-in. line for *Humble Pipe Line Company* from its Ector Station to the Kemper Station, in West Texas.

● **Latex Construction Company of Georgia, P. O. Box 184, Fond du Lac, Wisconsin.** Has 90 miles of 16 and 20-in. line between Oshkosh and Milwaukee, Wisconsin, for *Michigan-Wisconsin Pipe Line Company.*

● **Somerville Construction Company, Ada, Michigan.** Has 67 miles of 10 and 12-in. line from Clare County to Traverse City, Michigan, for *Michigan Consolidated Gas Company.* Also has 60 miles of 10 and 12-in. line between Muskegon and Ludington, Michigan, for the same company.

● **Williams Brothers Company, National Bank of Tulsa Bldg., Tulsa, Oklahoma.** Has 212.5 mile 20-in. crude line for *Socony Mobil Oil Company de Venezuela.* Line will extend from San Silvestre field to Puerto Cabello on the Caribbean Coast.

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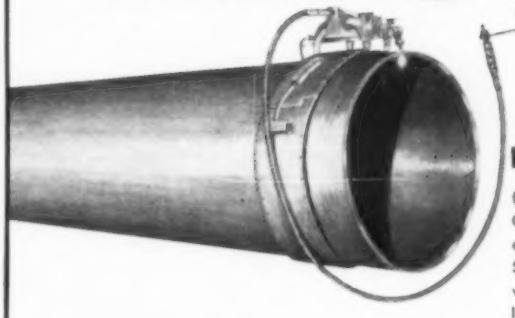

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Horsepower Ratings for "D" Section V-Belts

STANDARD QUALITY

Belt speed (ft per min.)	Equivalent diameter (d_e)										
	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0 and over
200	1.58	1.65	1.70	1.76	1.81	1.85	1.90	1.94	1.97	2.01	2.04
400	2.78	2.91	3.02	3.13	3.23	3.32	3.41	3.49	3.56	3.63	3.70
600	3.84	4.03	4.20	4.36	4.51	4.65	4.78	4.90	5.01	5.12	5.22
800	4.81	5.06	5.29	5.51	5.71	5.89	6.06	6.22	6.38	6.52	6.65
1000	5.71	6.02	6.31	6.58	6.82	7.06	7.27	7.47	7.66	7.84	8.01
1200	6.54	6.91	7.26	7.58	7.88	8.16	8.42	8.66	8.89	6.10	9.30
1400	7.31	7.75	8.15	8.52	8.87	9.20	9.50	9.78	10.0	10.3	10.5
1600	8.02	8.52	8.98	9.41	9.80	10.2	10.5	10.8	11.1	11.4	11.7
1800	8.67	9.23	9.75	10.2	10.7	11.1	11.5	11.8	12.2	12.5	12.8
2000	9.26	9.88	10.5	11.0	11.5	12.0	12.4	12.8	13.2	13.5	13.9
2200	9.79	10.5	11.1	11.7	12.3	12.8	13.2	13.7	14.1	14.5	14.9
2400	10.3	11.0	11.7	12.3	12.9	13.5	14.0	14.5	14.9	15.4	15.8
2600	10.7	11.5	12.2	12.2	13.6	14.2	14.7	15.2	15.7	16.2	16.6
2800	11.0	11.9	12.7	13.4	14.1	14.8	15.4	15.9	16.5	17.0	17.4
3000	11.2	12.2	13.0	13.8	14.6	15.3	15.9	16.5	17.1	17.6	18.1
3200	11.4	12.4	13.3	14.2	15.0	15.7	16.4	17.1	17.7	18.3	18.8
3400	11.5	12.6	13.6	14.5	15.3	16.1	16.9	17.5	18.2	18.8	19.4
3600	11.6	12.7	13.7	14.7	15.6	16.4	17.2	17.9	18.6	19.2	19.8
3800	11.5	12.7	13.8	14.8	15.7	16.6	17.4	18.2	18.9	19.6	20.2
4000	11.4	12.6	13.8	14.8	15.8	16.7	17.6	18.4	19.2	19.9	20.6
4200	11.1	12.4	13.6	14.8	15.8	16.8	17.7	18.5	19.3	20.1	20.8
4400	10.8	12.2	13.4	14.6	15.7	16.7	17.7	18.6	19.4	20.2	20.9
4600	10.4	11.8	13.1	14.3	15.5	16.6	17.6	18.5	19.3	20.2	20.9
4800	9.82	11.3	12.7	14.0	15.2	16.3	17.3	18.3	19.2	20.1	20.9
5000	9.18	10.7	12.2	13.5	14.8	15.9	17.0	18.0	19.0	19.8	20.7
5200	8.43	10.1	11.6	12.9	14.2	15.4	16.6	17.6	18.6	19.5	20.4
5400	7.57	9.26	10.8	12.3	13.6	14.9	16.0	17.1	18.1	19.1	20.0
5600	6.59	8.34	9.96	11.5	12.8	14.1	15.4	16.5	17.5	18.5	19.5
5800	5.49	7.31	8.98	10.5	12.0	13.3	14.6	15.7	16.8	17.9	18.8
6000	4.27	6.15	7.87	9.48	11.0	12.4	13.7	14.9	16.0	17.1	18.1

PREMIUM QUALITY

200	2.05	2.14	2.23	2.30	2.38	2.44	2.51	2.57	2.62	2.67	2.72
400	3.57	3.75	3.92	4.08	4.22	4.36	4.48	4.60	4.71	4.82	4.92
600	4.90	5.17	5.43	5.66	5.88	6.09	6.28	6.45	6.62	6.78	6.92
800	6.11	6.48	6.82	7.13	7.42	7.70	7.95	8.18	8.41	8.62	8.81
1000	7.23	7.69	8.11	8.50	8.87	9.21	9.52	9.82	10.1	10.4	10.6
1200	8.26	8.81	9.32	9.79	10.2	10.6	11.0	11.4	11.7	12.0	12.3
1400	9.22	9.86	10.5	11.0	11.5	12.0	12.4	12.8	13.2	13.6	13.9
1600	10.1	10.8	11.5	12.1	12.7	13.3	13.8	14.3	14.7	15.1	15.5
1800	10.9	11.8	12.5	13.2	13.9	14.5	15.1	15.6	16.1	16.6	17.0
2000	11.7	12.6	13.4	14.2	15.0	15.6	16.3	16.9	17.4	17.9	18.4
2200	12.4	13.4	14.3	15.2	16.0	16.7	17.4	18.1	18.7	19.3	19.8
2400	13.0	14.1	15.1	16.0	16.9	17.7	18.5	19.2	19.8	20.5	21.1
2600	13.5	14.7	15.8	16.8	17.8	18.6	19.5	20.2	21.0	21.6	22.3
2800	14.0	15.2	16.4	17.5	18.6	19.5	20.4	21.2	22.0	22.7	23.4
3000	14.3	15.7	17.0	18.2	19.3	20.3	21.2	22.1	23.0	23.7	24.5
3200	14.6	16.1	17.5	18.7	19.9	21.0	22.0	22.9	23.8	24.7	25.4
3400	14.9	16.4	17.9	19.2	20.4	21.6	22.7	23.7	24.6	25.5	26.3
3600	15.0	16.7	18.2	19.6	20.9	22.1	23.3	24.3	25.3	26.3	27.2
3800	15.1	16.8	18.4	19.9	21.3	22.6	23.8	24.9	26.0	26.9	27.9
4000	15.0	16.8	18.5	20.1	21.6	22.9	24.2	25.4	26.5	27.5	28.5
4200	14.9	16.8	18.6	20.2	21.8	23.2	24.5	25.8	26.9	28.0	29.0
4400	14.6	16.7	18.5	20.3	21.9	23.4	24.7	26.0	27.3	28.4	29.5
4600	14.3	16.4	18.4	20.2	21.8	23.4	24.9	26.2	27.5	28.7	29.8
4800	13.9	16.1	18.1	20.0	21.7	23.4	24.9	26.3	27.6	28.9	30.1
5000	13.3	15.6	17.7	19.7	21.5	23.2	24.8	26.3	27.6	28.9	30.2
5200	12.6	15.0	17.2	19.3	21.2	22.9	24.6	26.1	27.6	28.9	30.2
5400	11.9	14.3	16.6	18.7	20.7	22.5	24.2	25.8	27.3	28.8	30.1
5600	10.9	13.5	15.9	18.1	20.1	22.0	23.8	25.5	27.0	28.5	29.8
5800	9.93	12.6	15.0	17.3	19.4	21.4	23.2	25.0	26.6	28.1	29.5
6000	8.77	11.5	14.1	16.4	18.6	20.6	22.5	24.3	26.0	27.6	29.0

Notes: 1. Some of the smaller d_e values shown above are obtainable only with sheave diameters smaller than the minimum recommended in Table 1. Ratings for such small equivalent diameters are given in case it is necessary to use diameters smaller than the recommended minimum.
2. Belt speed is figured using the pitch diameter and R.P.M. of one of the sheaves on the drive.
3. If belt speeds are over 5000 feet per minute the sheaves may require special construction or special material. They may also require dynamic balancing. Such applications should be referred to the manufacturer.

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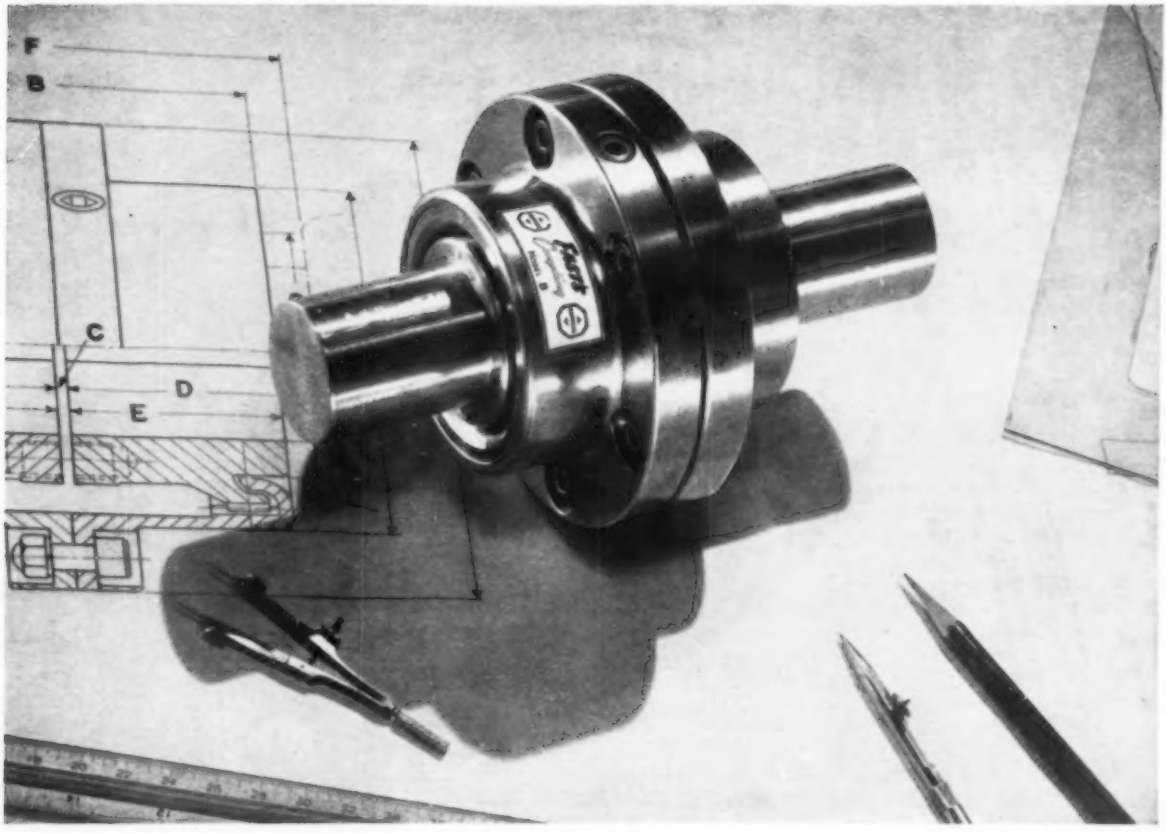

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PIPELINE PERSONALS

▸ **E. F. Lindahl** and **L. J. Sturbois,** Casper, Wyoming, have been given new appointments by the Ohio Oil Company. Lindahl becomes manager of supply and transportation for the Oasis Oil Company of Libya, North Africa, Ohio Oil subsidiary. Sturbois succeeds Lindahl as production safety supervisor.

Lindahl joined the company in 1941 in the production department. Sturbois started in 1944 with Illinois Pipe Line Company of Texas, an Ohio Oil subsidiary.

▸ **Dr. Lester M. Goldsmith** has been honored by The Atlantic Refining Company for the completion of 40 years of service with the company. He is general manager of the company's engineering and construction department.

Well-known for his many engineering contributions to the advancement of the petroleum industry, he pioneered the application of electric welding of pipe lines and ocean-going tankers, engineered the development of the first high-pressure, high-temperature, turbine electric steamship and was responsible for the supertankers used in the oil industry.

▸ Three new vice presidents have been elected for Williams Brothers, Tulsa, Oklahoma. They are: **C. M. Collins,** formerly executive vice president of Williams Brothers Corporation, engineering division of Williams Brothers Company, who joined the firm in 1945, and has served in many engineering executive capacities; **Emery G. Thiel,** a widely experienced auditor and accountant, was advanced from secretary-treasurer of the firm, having joined Williams Brothers in 1946; and **Maurice B. Kite,** who will also be manager of the general construction division, having joined Williams Brothers in 1954 as superintendent of pump station construction on the Minnesota Pipeline project.

▸ **Robert C. Berry** has been made treasurer of Trans-Canada Pipe Lines, Ltd. Berry left the firm of Deloitte, Plender, Haskins & Sells, chartered accountants, to accept this new position. He is located in Trans-Canada's Toronto, Ontario, office.

▸ **Arthur J. Helmbrecht,** vice president, has been elected a director of The Buckeye Pipe Line Company. He joined Buckeye Pipe Line as assistant to the chief engineer. He subsequently served as chief engineer and as assistant to the president.

▸ **Walter E. Biery,** general manager of the Mid-Continent Pipe Line Company, has been elected a vice president of the company. Biery succeeds to the post recently vacated by the retirement of **R. H. Wills,** formerly associated with D-X Sunray Oil Company, of which the pipe line company is a subsidiary. Wills remains a member of the Mid-Continent Pipe Line Company board of directors.

▸ The Pipe Liners Club of Tulsa has five new members. They are: **F. B. Neptune,** Phillips Pipe Line Company; **John B. Benear,** Cities Service Oil Company; **R. W. Marshall, Jr.,** Oklahoma-Mississippi River Products Line; **Gene T. Kinney,** The Oil & Gas Journal; and **H. W. Gilliland,** Power Machinery Company.

A. R. Heidebrecht

▸ **Allen R. Heidebrecht** has been promoted to manager of operations and engineering for Platte Pipe Line Company, Kansas City, Missouri. Prior to the promotion he was chief engineer. After being graduated from Kansas State College in 1934 with a BS in electrical engineering, he joined the Kansas Gas and Electric Company, where he worked for 16 years. In November, 1950, he joined the Platte organization.

▸ **Walter E. Jennings,** executive vice president and member of the board of directors of The Buckeye Pipe Line Company, has retired after completing over 48 years of service.

▸ Recent changes in Plantation Pipe Line Company's personnel are: **Robert C. Martin** to an engineering assignment with an affiliate; **George M. Jeffares** to cathodic protection engineer; **Robert S. Cannon** to supervising engineer of the home office's engineering department; **Thomas V. Bockman,** to the Atlanta office engineering staff as electrical engineer; **Louis G. Maier, Jr.** electrical foreman in central division; **Robert M. Culver, Jr.** to western division engineer; **William E. Winston** to electrical foreman in the western division; **Francis L. Brittain, Jr.** office engineer; **James F. McLamb** to division engineer, eastern division, and **Joseph D. Weede** to vice president-operations.

▸ **Barney Laulhere,** president and manager of Hood Construction Company, and **Ross J. Lyons,** president of Corrosion Engineering Corporation, have announced that the two firms have entered into a working agreement. Hood Construction is engaged in the installation of gas and oil distribution and gathering lines in California, the Northwest, and the Rocky Mountain states. Corrosion Engineering is the developer of a unique method for the internal coating of gas, oil, and water lines in place.

▸ **C. L. Perkins** has been elected president of El Paso Natural Gas Products Company, a subsidiary of El Paso Natural Gas Company. He will continue as vice president and director of the parent company. **Paul Kayser,** president of the parent company, has been named chairman and chief executive officer of the products subsidiary. **C. C. Cragin,** formerly an officer and now consultant to the parent company, was elected a director of the subsidiary. **Hugh F. Steen,** vice president and general superintendent of the parent company, was promoted to manager of pipeline operations of the parent. He will continue as a vice president and director.

▸ **Nelson M. Lytle,** former master mechanic, has been named to the newly created position of assistant superintendent of Interstate Oil Pipe Line Company's Sunset, Louisiana, district.

▸ **Robert P. White** has been named vice president in charge of the H. C. Price Company's pipe coating division. He succeeds **J. Stewart Dewar,** who has retired after 14 years as head of pipe coating operations.

▸ **Karl T. Feldman,** Sinclair Pipe Line Company, Independence, Kansas, has been elected a member of the board of directors of Platte Pipe Line Company.

▸ **J. D. Davis,** of Shreveport, Louisiana, has been named to the position of assistant to Ed Parkes, president of United Gas Pipe Line Company and Union Producing Company and executive vice president of United Gas Coporation.

Davis fills the post formerly held by **D. D. Dillingham, Jr.** He was formerly superintendent of the firm's western pipe line division.

▸ Texas Gas Transmission Corporation has announced the promotion of three members of its engineering staff. **James N. White,** formerly supervisor of compressor station construction, has been appointed assistant superintendent of design engineering; **Gerald A. Suddoth,** formerly senior engineer, has been made supervisor of compressor station construction, and **James O. King,** formerly senior engineer, has been promoted to senior staff engineer.

L. E. Ingham, vice president of Texas Gas Transmission and a member of the firm's board of directors, has retired after more than 46 years in the natural gas industry. He will continue to serve as a member of the board.

▸ **E. W. Bergquist,** assistant district superintendent of the Magnolia, Arkansas, district of Interstate Oil Pipe Line Company, has been named acting district superintendent of the company's Billings, Montana, district, Berquist replaces **Hermon S. Foote.**

▸ **Elwood Kisby** has been named president of Michigan-Ohio Pipeline Corporation. Kisby, vice president of Michigan-Ohio since 1953, succeeds **Charles A. Schrader** who recently resigned from Michigan-Ohio to become vice president of supply and transportation at Leonard Refineries, Inc.

New Water Line, which will treble present supply to Lenoir, N. C., consists of 50-foot lengths of steel pipe, lined and coated with Bitumastic No. 70-B AWWA Enamel. The Koppers Contract Coating Department set up complete field cleaning, lining and coating facilities at the job site. Coal-tar enamel linings are the only type allowed in the recommended specifications of the American Water Works Association. Coal-tar coatings are the only materials which field experience has proved can resist water and provide high electrical resistance over long periods of time.

Extra Life given this warehouse through the protection of Bitumastic coatings has been estimated at 10 years. The all-metal structure was cleaned completely by power and hand wire-brushing, then coated with a system using Bituplastic® No. 28, a sunlight-resistant coal-tar coating. A coat of aluminum paint on the building's lower portions completed its fresh appearance.

This New Bulletin outlining the useful scope of Bitumastic protective coatings is now available. You'll find it a handy guide in the selection of corrosion-resistant coatings for your applications. Write for your copy today: Koppers Company, Inc., Tar Products Division, 1450 Koppers Building, Pittsburgh 19, Pa.

how to
CUT CORROSION LOSSES
a report by Koppers Company, Inc.

Number 7 of a series

F. P. Filer
Project Leader

In this Corrosion Report, we would like to explore the functions of primers and the contribution which they can make toward the success of protective coating systems. While every step in a protective coating system is important, from precoating survey to finished coating, one of the more important is priming.

* * *

Basically, primers have one specific function: to bond intermediate and finish coats to the metal surface. To perform this function properly, it is vitally important that the primer be compatible with the intermediate and finish coats.

* * *

While priming is used with most protective coatings—with the exception of certain proprietary coal-tar coatings—no primer can compensate for incomplete surface preparation. The Steel Structures Painting Manual states specifically, "Any primer sold on the basis that it eliminates the preparation of the surface should be viewed with extreme caution." Rust, dirt, grease, and loose scale should *always* be removed before priming. In some cases, primers are applied over tight mill scale in the shop. Good practice would dictate removal of scale before priming to obtain a long-lived coating system.

We have often been asked whether shop primers (applied by the metal fabricator) should be used. One disadvantage is that they sometimes become badly scratched in transit and require considerable touch-up on the job site. Other drawbacks are that shop primers may not provide protection for a sufficiently long period, and may be applied without regard to their compatibility with the field coating specified. Also, shop primers may cover up inadequate surface preparation jobs.

The following points should be considered before specifying shop primers: (1) corrosivity at the job site; (2) estimated time between shop priming and field coating; (3) compatibility with the coating.

* * *

The terms "wash primer" and "primer" should not be confused. A wash primer is not a true primer but an integral part of surface preparation. It does not take the place of a primer when priming is required. Sometimes, wash primers are specified for short-term protection before application of self-priming, cold-applied coal-tar coatings.

* * *

From an application standpoint, there are three characteristics of primers that are of importance: wetting ability, consistency, and drying time. Properly selected and applied, primers should provide a uniform, tightly-bonded film to which the coating system will adhere tenaciously.

* * *

Your comments on these Reports will be appreciated. If there are any specific questions which you have relating to corrosion control, write Koppers Company, Inc., 1450 Koppers Building, Dept. 105C, Pittsburgh 19, Pa. District Offices: Boston, Chicago, Los Angeles, New York, Pittsburgh and Woodward (Birmingham) Ala. In Canada: Koppers Products, Ltd., Toronto, Ontario, and Edmonton, Alberta.

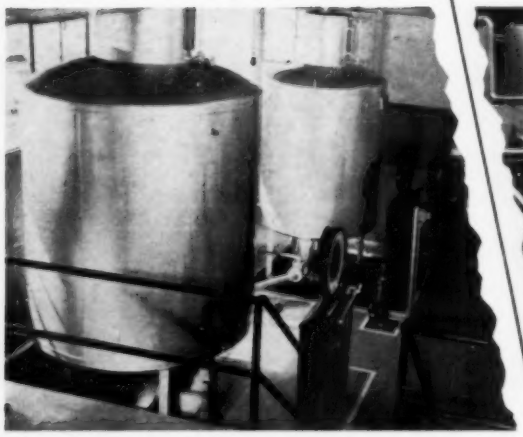
KOPPERS

BITUMASTIC
REG. U. S. PAT. OFF.
COATINGS AND ENAMELS

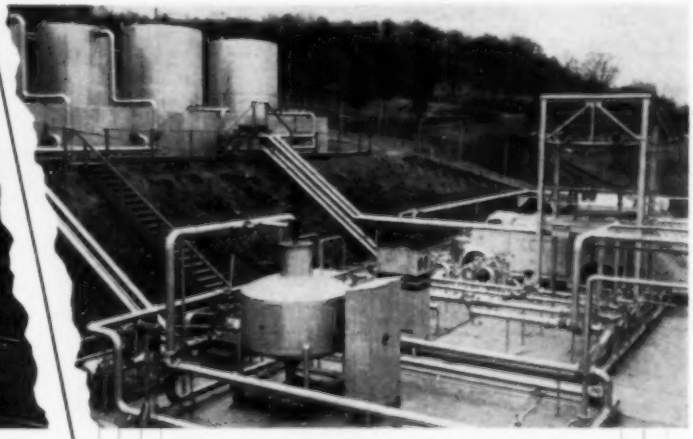
FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD

EXCEL-SO METER CALIBRATING TANKS

SELECTED FOR THE ROCKWELL TEST STATION AT PITTSBURGH



Rockwell's indoor proving room is equipped with EXCEL-SO Calibrating Tanks for controlled metering.



EXCEL-SO Calibrating Tank in service at world's largest meter and valve testing installation—Rockwell Test Station.

In world wide service this famous EXCEL-SO product has proven itself as a scientific measuring instrument—not just an ordinary welded tank. It is designed and fabricated to meet the most exacting requirements—meter testing under laboratory conditions. In stationary, portable and high pressure service it insures greatest metering accuracy for petroleum products. Write Warner Lewis Company for further information.

WARNER LEWIS COMPANY

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Representatives in all major cities. In Canada: FRAM CANADA, LTD., Stratford, Ontario

Transco Reaps Awards For Safety Records

New safety records were set last year by the 1500 employees along 1840 miles of the Texas-to-New York system of Transcontinental Gas Pipe Line Corporation, Tom P. Walker, Transco president, announced.

Notices of safety honors for 1956 were still coming in to the Houston office of Stanley Owens, Transco's director of safety. Already received were two national and state awards from Texas, Alabama, Pennsylvania and New Jersey.

The Accident Prevention Award of the American Gas Association recognized the 55 percent reduction below the 1955 accident frequency rate. The 1956 record rate was 4.5 injuries per million man-hours worked.

The Award of Merit from the National Safety Council was for a "noteworthy performance over a three-year period."

From the State of Alabama Transco received three Certificates of Merit, one for each of the compressor stations in that state.

An Award of Honor will be given Transco by the Department of Labor and Industry in Pennsylvania for the perfect safety record at the Transco installations near Philadelphia.

The New Jersey Department of Labor and Industry awarded Transco a Certificate of Merit for a perfect safety record in the annual statewide contest.

The Texas award is for "outstanding industrial safety achievement" and will be given Transco by the Texas Safety Association.

Bell Oil and Gas Buys 100 Mile Gathering System

The Ben Franklin Refining Company, subsidiary of Bell Oil and Gas Company, has acquired, effective March 1, the Cotton County gathering system running from Cache Creek, Oklahoma, east to Healdton, Oklahoma, where it joins the Ben Franklin main gathering system serving the Ardmore refinery. In addition to the gathering system the Ben Franklin has also acquired an 80,000 bbl tank at Healdton for extra storage and transfer purposes.

In tying in the two systems, Ben Franklin also acquired from Cherokee Pipe Line Company approximately 10½ miles of 8-in. line. This line begins at Cherokee's Hewitt station, running due west to Section 30, 4S 3W, approximately 1½ miles east of the town of Ringling, Oklahoma. This acquisition will be tied into the Cache Creek gathering system and will provide complete flexibility.

Trans-Canada Strings Pipe Completes Financing Program

Trans-Canada has completed underwriting of first mortgage bonds and subordinated debentures and obtained a long-deferred permit from the dominion Board of Transport Commissioners for construction of its entire proposed line from the Alberta boundary to Toronto and Montreal. The underwriting consists of $104,000,000 in 5½ percent first mortgage bonds and $112,500,000 in debentures carrying rates of 5.60 percent in the United States and 5.85 percent in Canada, to be issued in units with five common shares at $10 with each $100 principal amount of debentures.

Pipe has now been strung on all of sections 3 and 4. It is being strung on section 5 from a new almost fully automatic double-jointing yard set up by Price-Poole, contractor on this section. Deliveries are almost completed on section 6, but no stringing has been done.

Trans-Canada is confident now that its fall deadline for delivery of gas to Winnipeg can be met.

FIRST

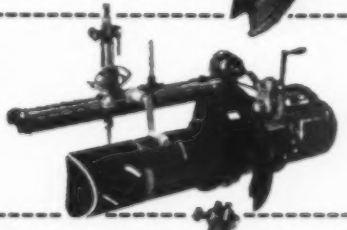
Choice for Pipe Cutting and Beveling Equipment

Mathey

PIPE CUTTING & BEVELING

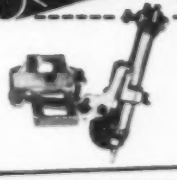
Quick, easy operating. Just slips over pipe, no hinges or latches to open or close. Light weight reduces fatigue factor. Clean, accurate cuts.

Sizes 1 to 5 for Pipe 4" to 36" diameter. No. 5 machine available with optional closed gear section, insertable after pipe machine is slipped over pipe.



SHAPE & COUPON CUTTING

For cutting pipe to weld angular intersections to job requirements. Coupon cutting for welding analysis. Easily operated.



OUT-OF-ROUND ATTACHMENT

For accurately cutting out-of-round pipe, maintaining interval between torch tip and out-of-round pipe insuring clean, accurate cut.

for SPEED, ACCURACY, DEPENDABILITY, SERVICE AND ECONOMY—IT'S MATHEY

C. A. Mathey MACHINE WORKS, INC.

212 SO. FRANKFORT TULSA, OKLA. • PHONE Diamond 3-3623

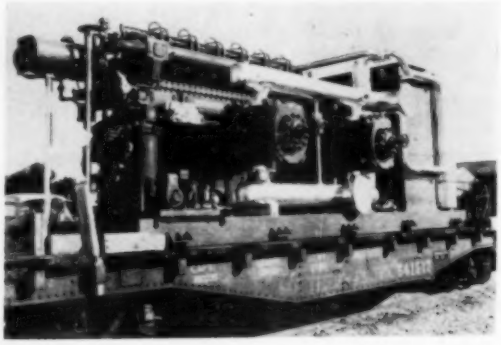
Original manufacturers and engineers of all Mathey type Pipe Cutting and Beveling machines.

NEW Pipeline Equipment

• machinery • supplies • services

For more information on items described here in brief, use the handy reply card and circle the corresponding numbers

Turbocharging Hits Gas Fields. Engineers at Worthington have produced a new turbocharged gas-engine compressor known as the SLHC. Available in the medium horsepower range (330-880 hp), engine-compressor is reported to be the only gas-engine compressor in its class size that has been turbocharged.



First unit is now in operation in a field gas-gathering station at Muncie, Oklahoma, and is pumping gas from some 25 wells.

Turbocharger, deriving all of its energy from otherwise wasted exhaust gas, compresses ambient intake air to an elevated pressure for cylinder charging. This results in a greater power and weight per unit space and therefore has greater portability.

The SLHC gas-engine compressor is designed for pipeline distribution service; in natural gasoline plants; for pressure maintenance in oil fields, and for oil refinery operations such as vapor recovery, recycling, and stabilization of gases.

Five SLHC sizes are available in 4, 5, 6, 8, and 10 power cylinder combinations —in in-line design. *Worthington Corporation.*

Circle number (81) on reply card.

Emulsifiers—Corrosion Inhibitors. Ranging from emulsifiers to corrosion inhibitors, quaternary ammonium salts made by the chemical division of Armour show a wide variety of applications.

The chemical and physical characteristics of these cationic surface-active agents, along with their applications and formulations, are outlined in a newly published booklet called *Arquads*, the Armour trade name for quaternaries. Described as wetting, sanitizing, and emulsifying agents, the Arquads may be water soluble, oil soluble, or water dispersible, depending on their composition. *Armour and Company.*

Circle number (82) on reply card.

Tractor Odometer. Designed to aid the machine owner in recording accurate job data, a new type odometer, which accurately records the distances traveled by Caterpillar tractor-type tractors, is now made available. The unit can be easily and inexpensively mounted on spoke-type and disk-type idlers. The unit gives excellent accuracy in the low speed ranges, registering positive mileage in both forward and reverse gears. It will provide 98 percent accuracy in the lower 3 gear ranges. *Caterpillar Tractor Company.*

Circle number (83) on reply card.

Tone-Actuated Monitor. The first CONELRAD monitor receiver which requires both carrier break and 1000-cps tone to activate an alarm has been announced by Motorola.

Unit is designed to eliminate nuisance alarms caused by carrier break alone. It monitors standard broadcast stations for the CONELRAD Radio Alert, which consists basically of two 5-sec carrier breaks followed by a 1000-cps tone and a voice message. FCC regulations require land-mobile radio stations to make provisions for receiving this alert. *Motorola, Inc.*

Circle number (84) on reply card.

Tiny Battery. General Electric is in pilot production on a tiny new power source, 1/35 the size of a flashlight battery, but with 60 times the voltage. Designed for highly-specialized uses requiring small size, long life, and high voltage output, 1-in. long battery has a projected life of over 20 years.

Company believes it to be applicable to remote warning devices, deep well survey equipment, and electronic instruments. New battery produces 95 v, weighs 1/5 ounce and less than ⅛ in. in diameter. Research and development was carried out by Dr. W. J. van der Grinten of the company's Electronics Laboratory. *General Electric Company.*

Circle number (85) on reply card.

All-Electric Valve Actuator. All-electric actuator is a recent development of Conoflow.

Series "D" Actuator is an all-electric proportional positioning device for use in conjunction with modern electronic control systems. An unprecedented feature is that it requires no intermediate pneumatic or hydraulic-operating fluids. Unit combines the desirable features of an all-electric system with the mechanical simplicity and ruggedness of commercial pneumatic actuators. *Conoflow Corporation.*

Circle number (86) on reply card.

Coating Specifications. G. L. Industrial Coatings announces the first of painting, under-coating, and surface preparation specifications developed specifically for each industry and its subdivisions. These specifications are only released after G. L. paint engineers and technicians have made an individual and exhaustive study of the industry and all factors surrounding its operating conditions. *G. L. Industrial Coatings, Inc.*

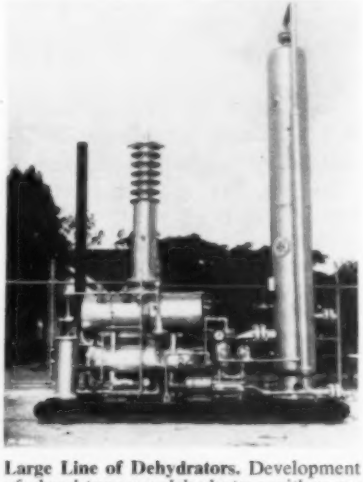
Circle number (87) on reply card.

Low Tension Boosts Ignition Efficiency. Low-tension ignition systems for nearly all large spark-ignited engines of 2, 3, 4, 6 and 8 cyl is announced by the magneto division of Fairbanks-Morse.

F-M low-tension ignition consists of a low-tension magneto with individual high-tension ignition transformers mounted at each cylinder. This new ignition development has been designed and field-tested to give vastly improved performance not only on the new model engines with their high-compression ratios, but also on the many thousands of engines already in the field.

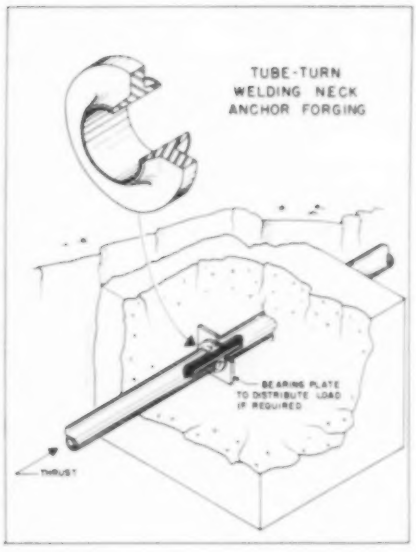
In addition to providing advantages under normal operating conditions, the F-M low-tension system enables large engines to operate without constant operator attention. For example, even if one transformer should go dead on an unattended installation, the engine will continue to operate until repairs can be made. *Fairbanks, Morse and Company.*

Circle number (88) on reply card.



Large Line of Dehydrators. Development of glycol-type gas dehydrators with processing capacities ranging from 1,700,000 to more than 60,000,000 cu ft of gas daily is announced by Delta Tank. Dehydrators are designed to reduce water vapor content of natural gas to less than 7 lb per million cubic feet of gas or depress dew point of the gas 65 deg. Water-absorbing capacity of the units is increased through action of Delta's external glycol-gas heat exchanger, which cools the glycol before contacting the gas stream. *Delta Tank Manufacturing Co., Inc.*

Circle number (89) on reply card.

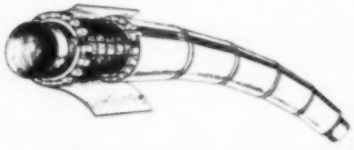


Anchor Holds High Pressure Piping. The problem of how to satisfactorily anchor high pressure oil and gas pipelines at compressor stations, river crossings and valve and meter settings is reported to be more adequately solved with the recent introduction of an improved welding neck anchor forging. Forging takes the form of a double hubbed flange with no bolt holes, which may employ a bearing plate to distribute the load. Hubs, of the straight taper type recently adopted by MSS for large diameter pipeline flanges, are butt welded to the pipe where it is to be held immobile, and assembly buried in a reinforced concrete block of suitable dimensions. The Tube-Turn welding neck anchor forging, available in sizes to match any pipe dimensions, and for the usual pressure conditions, is produced in any of the materials customarily used for flanges. Forging offers important advantages. It reduces maintenance costs and hazards that may occur when steel straps are used for anchoring purposes and permits 35,000 psi minimum yield strength flange material to be joined to as high as 52,000 psi minimum yield strength pipe without overstress. *Tube Turns, Division of National Cylinder Gas Company.*

Circle number (90) on reply card.

Casted Concrete Pipe Coating. Concrete coating process for use on pipeline from 30 in. down to 4 in. utilizes prepared and sacked material weighted to customer specifications. Carefully designed and engineered wrap-around forms with reinforced mesh and banding material, combined with a special spacer form arrangement, are components of this new process called "Form-Crete."

With this process, pipe bends and continuous welded sections can be poured at the site. The principle advantage stated by the manufacturer is that pipe can be



coated in the field and in remote places without the need of special machinery and equipment. By knowing the weight of the pipe, the specific gravity of fluid at the crossing and the desired negative buoyancy, the most economical thickness and heavy weight aggregates can be selected for the particular application.

In application, forms are designed to cast proper thickness and space—reinforcing wires approximately halfway between form and wall of the pipe. Operations involved in coating consist of placing spacers on pipe on 4 ft centers, wrapping reinforcement wire around the pipe, wrapping flexible forms around the outside of the spacers and banding forms on. Ready-mix concrete is poured into the gap and vibrated for compactness. After the concrete is set, wrap-around forms are removed for reuse. Spacer forms imbedded in the concrete coating form an integral part of the pipe coating. *Mallard & Hinkle.*

Circle number (91) on reply card.

Weather-protected Motor. Weather-protected motor (Type FOD) for non-hazardous outdoor installations in ratings of 250 hp and larger is built into a rigidly constructed fabricated steel frame equipped with 2 removable air ducts. The heavy steel removable air intake ducts have openings at each end. Their design minimizes the effects of high velocity winds and minimizes the entrance of entrained moisture and particles into the electrical parts of the machine.

Air intake ducts are equipped with protective screens just above the intake openings, and air discharge openings in the bottom of the frame are baffled and screened. Applications served by the weather-protected motor are petroleum pipeline pumping and refining, chemical plants, power house auxiliary drives, cooling towers, general pumping, mining and mineral processing. *Allis-Chalmers Manufacturing Company.*

Circle number (92) on reply card.

The WILKINSON LINE LOCATOR

SEES AND TELLS

Instantly locates subsurface pipes, cables and such, and determines depth accurately. The etched circuitry, our latest innovation, assures better quality control and performance than the customary hand wiring mehod.

Avoid damaged structures and prevent loss of time with the Wilkinson Locator.

A new loop antenna increases power and selectivity. Instrument cases are now built of wear resisting phenolic material.

WILKINSON PRODUCTS COMPANY

3987 Chevy Chase Drive, PASADENA 3, CALIFORNIA. SYlvan 0-4314

NEW LITERATURE

For more information on items described here in brief, use the handy reply card and circle the corresponding numbers

Compressor Line. A new, 16-page bulletin, showing a complete line of small, air-cooled compressors for industrial, commercial and general use is offered by Gardner-Denver. Compressors described are widely used for a variety of jobs. Models shown include bare compressors and those with horizontal and vertical tanks. A popular trailer model used extensively by contractors, utilities, and industrial plants is included. *Gardner-Denver Company.*

Circle number (93) on reply card.

Excavator-Crane. Insley Manufacturing has issued a 5-page bulletin on its new excavator-crane called the "Pipeliner." Illustrated bulletin contains general specifications for its use in the field plus its dimensions and weights both as a backhoe and as a clamshell. Optional equipment is also given. *Insley Manufacturing Corporation.*

Circle number (94) on reply card.

Construction Machinery. Usage information on the HD-11G and the HD-6G diesel-powered crawler tractor shovels highlights Allis-Chalmers brochures MS-1137 and MS-1126. Matched attachments designed specifically for each model are shown both through line drawings depicting them in action, and with catalog views. *Allis-Chalmers Manufacturing Company.*

Circle number (95) on reply card.

Pipe Operations. A new 28-page brochure covering the conditions for processing and prices of all services, including coating and wrapping, hydrostatic testing, threading and coupling, beveling, welding, API drifting, straightening, and storage of pipe is available. *Syd E. Culbertson Co., Inc.*

Circle number (96) on reply card.

Arc Welding Machine Catalog. Arc welding machine and accessory catalog is available from Air Reduction Sales. Selenium rectifier and d-c motor generator arc welders for industrial welding, a-c and d-c engine driven arc welders for construction and maintenance, a-c transformer arc welders for plant and shop use are examples of the complete Airco line of welding machines illustrated and described in this catalog. *Air Reduction Sales Company, a division of Air Reduction Company, Inc.*

Circle number (97) on reply card.

Verti-Line Close-coupled Industrial Pumps. Easy to use table for determining horsepower, capacity and head for vertical pumps makes this bulletin worth keeping. Also contains sectional views, material specifications, schematic application drawings, and photos of installations. *Layne & Bowler Pump Company.*

Circle number (98) on reply card.

Cathodic Protection Rectifier. This is the title of catalog on Good-All rectifier units used in pipeline cathodic portection installation. Book includes data for engineering, selection and application of units. *Good-All Electric Manufacturing Company.*

Circle number (99) on reply card.

"All Holes Barred." A new 20-minute color movie showing the correct application of "Scotchrap" vinyl pipe insulating tape for corrosion prevention is *"All Holes Barred."* Prepared as a training film for free showing to workmen using vinyl pipe insulating tape, the new film is available through 3M branch offices and salesmen. The color and sound movie presents corrosion principles in a very elementary manner with cartoon characters dramatizing the effect of electrolysis on unprotected and faultily protected pipe. *Minnesota Mining and Manufacturing Co.*

Circle number (100) on reply card.

Comprehensive Valve Lubricant Bulletin. New 12-page version of Rockwell's comprehensive bulletin on "Lubricants for Rockwell-Nordstrom Valves" provides detailed lubricant selection data, including information about 80 new lubricants. Leading lubricants are described in more detail than in previous bulletins. *Meter and Valve Division, Rockwell Manufacturing Company.*

Circle number (101) on reply card.

Treatise Simplifies Selection of Coatings. More than a catalog, the new Rust-Oleum 1957 Coating Manual—which is actually a treatise highlighting the stopping and preventing of rust on nearly all types of rustable metal—is available from Rust-Oleum. Incorporating Rust-Oleum's 35 years' experience in rust prevention, it features the results of over 2 years of intensive research in areas where conditions of excessive moisture, salt spray, fumes, gases, weather, and other rust-producing agents are severe.

This comprehensive, 32-page full-color manual provides a practical, workable guide for all buyers and users of protective coatings. It contains information and recommendations which enable the user to determine quickly and accurately the specific coatings needed to protect practically any rustable metal surface. *Rust-Oleum Corporation.*

Circle number (102) on reply card.

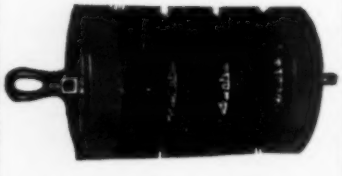
Air Compressors. Kellogg has published a new 20-page catalog covering its line of ⅓ to 20-hp air compressors for automotive and industrial use. Well illustrated, the booklet gives complete specifications on single and 2-stage models, portable models, tanks, pumps, and accessories. Useful charts, data, and information on compressed air are also included. *Kellogg Division, American Brake Shoe Company.*

Circle number (103) on reply card.

Thermometers and Hydrometers. A new, 24-page booklet featuring the latest information on thermometers and hydrometers is published by Central Scientific. Booklet contains a complete listing of ASTM, general and specific purpose thermometers and hydrometers for measurements of temperature and specific gravity. ASTM thermometers are listed by number and test. *Central Scientific Company.*

Circle number (104) on reply card.

MOLE
Pipeline Cleaner



for BETTER cleaning of
CRUDE LINES
PRODUCT LINES
NATURAL GAS LINES

FOR DETAILS WRITE

Pipeline Cleaners Co.
Fort Madison, Iowa

NOTICE: Specify **PELCO** Welding Saddles

No change except the corporate name. We still have the same ownership, same management, same address, same telephone, and use the same 45 years of experience to render the same service under the same trade name—"PELCO."

PELICAN SUPPLY CO. INC.

P. O. Drawer 1108 Shreveport (84), La.

SEE YOUR NEAREST SUPPLY HOUSE

(Formerly: Pelican Well Tool & Supply Company)

DRILLING RIG LOCATOR

SPRING 1957

A Directory of Contract Drilling Rigs

the Petroleum Engineer
DRILLING & PRODUCING

P.O. Box 1589 Dallas 21, Texas

THE PETROLEUM ENGINEER'S Spring

DRILLING RIG LOCATOR

In its second year of publication, this exclusive directory of contract rotary and cable tool rigs in the U. S. and Canada is the largest of its size ever published anywhere.

Here's what it contains:

- **Contractor's name and address**
- **Rig number or name**
- **Type power and fuel**
- **Total hp on main mud pumps**
- **Drawworks make and model**
- **Hp available to drawworks**
- **Rated drilling depth**
- **Current location**

Nearly 750 drilling contractors and approximately 2900 rotary and cable tools are listed in THE PETROLEUM ENGINEER'S Spring DRILLING RIG LOCATOR, now in its second year of publication. This makes your current directory the largest of its type ever assembled. Response and acceptance by contractors and operators alike has been greater than was originally envisioned. The beginning of each year finds a lull in drilling activity, and 1957 is no exception. But, with this lull, the total number of rigs listed herein is even greater than in our past October Fall directory when normal rig activity is at a peak for the year. The size and utility of the RIG LOCATOR increases with each issue.

Something new added. It has been our earnest attempt to improve the LOCATOR's utility with each succeeding publication . . . for, how else can the directory progress? For the first time, this Spring directory has been made an integral part of the regular issue of THE PETROLEUM ENGINEER, but bound in a manner that it can be removed and still be intact as a single directory. This was done in response to numerous requests that it be in some way separated. By gluing it between the back cover and the last editorial page, the RIG LOCATOR can be extracted, leaving the March issue together, and providing a greater degree of utility of the directory.

How to use the RIG LOCATOR. Locations of contract rigs are shown by states and counties (or parishes) in the U. S. and by province and area in Canada. If you are interested in drilling a given well in a certain county, parish, or area, in the case of Canada, and this well could be drilled most efficiently by a certain type rig, you can easily locate those contractors who operate rigs in your area of interest. If the rig you are looking for is not shown in the county where you want to drill a well, look under the adjacent counties. Once the rig has been located, and the contractors name ascertained, go back to the alphabetical listing of contractors to obtain his mailing address.

Use of abbreviations. In a directory of this type where certain specifications are included, it was necessary in the conservation of space to make some abbreviations. Under the column of "type power", the following abbreviations apply: dsl for diesel; gaso for gasoline; stm for steam; btne for butane; and dsl elec for diesel electric. In listing drawworks make and model number, it was necessary to abbreviate the manufacturer's name. Some of these abbreviations are well known; others had to be made to fit the available space: Here's the code we used:

Manufacturer's Company Name	Abbreviation
ALCO Products, Inc. (formerly Beaumont Iron Works Div. of American Locomotive Co.)	ALCO-BIW
Allis Chalmers Manufacturing Co.	Allis Chmrs
American Iron & Machine Works	Amer
Ansaldo	Ansaldo
Beaumont Iron Works (See ALCO Products, Inc. Name no longer officially used)	ALCO-BIW
Bethlehem Supply Co.	Beth
Big Four Machine & Supply Co.	Big Four
The Brewster Co., Inc.	Brwstr
Bucyrus-Erie Co.	B. Erie
Cardwell Manufacturing Co., Inc.	Crdwll
Clark Brothers Co., Inc.	Clark
Fred E. Cooper, Inc.	Cooper
Cummins Engine Co., Inc.	Cummins
Emsco Manufacturing Co.	Emsco
George E. Failing Co.	Failing
Franks Manufacturing Corp.	Frnks
General Machine Co.	Gen Mach
Hacker Machine & Supply Co.	Hacker
Hopper Machine Works, Inc.	Hopper
Houston Tool Co.	Hou
Ideco (One of the Dresser Industries)	Ideco
Ingersoll-Rand Co.	Ingersoll
Jones, Shelburne & Guffey Co.	JS&G
Joy Manufacturing Co.	Joy
Mayhew Supply Co., Inc.	Mayhew
Lee C. Moore Corp.	L. C. Moore
Muskogee Iron Works	MIW
The Natural Supply Co.	Natl
Oil Well Supply Division (U. S. Steel Corp.)	Oilwell
Reich Bros.	Reich
Spencer-Harris Machine & Tool Co.	Spencer
Stardrill-Keystone Co.	Star
Texas Iron Works, Inc.	TIW
Unit Rig & Equipment Co.	Unit
Wagner Morehouse, Inc.	Wgnr Mrhse
Walker-Neer Manufacturing Co., Inc.	Wlkr-Nr
Waldrip Engineering Co.	Wldrp
Well Machinery & Supply Co., Inc.	Ft. Wrth
Wheeling Machine Products Co.	Wheeling
The Wheeling Co.	Whlnd
Wichita Tool Supply Co.	Wich
Wichtex Machinery Co., Inc.	Wichtex
Wilson Manufacturing Co., Inc.	Wlsn

U. S. DRILLING CONTRACTORS

ROTARY AND CABLE TOOL

ALPHABETICAL LISTING

Ace Drilling Co
1800 Rep Natl Bk Bldg
Dallas Tex

Admiral Drlg Co
2030 Gulf Bldg
Houston 2 Tex

Advance Drlg Co
Box 511
Mt Vernon Ind

Ainsworth Inc
1002 Union Natl Bk Bldg
Wichita Kans

Akin & Dimock
714 Holliday St
Wichita Falls Tex

Alan Drlg Co
807 Oil and Gas Bldg
Wichita Falls Tex

Aldridge and Stroud Inc
Box 962
Odessa Texas

Allen & Morris
820 Alamo Natl Bldg
San Antonio Tex

Allen Drlg Co
4410 Venable Ave
Charleston 4 W Va

W C Allen
Box 263
Oil City La

Allied Exploration Co
207 Huff Bldg
Wichita Falls Tex

B F Allison Drlg Co
626 Patterson Bldg
Denver Colo

Alven Drlg & Exploration Co
Box 201
San Angelo Tex

Anderson Drlg Co
730 Wichita Natl Bk Bldg
Wichita Falls Tex

Andree Drilling Co
City Natl Bldg
Wichita Falls Tex

An-Son Drlg Co
3814 N Santa Fe
Oklahoma City 18 Okla

An-Son Gulf Drlg Co
716 Hibernia Bldg
New Orleans La

Anschutz Drlg Co Inc
1411 Mile Hi Center
Denver Colo

Appell Drlg Co
Box 330
Alice Tex

Appling Drlg Co Inc
Box 69
El Campo Tex

Arapahoe Drlg Co
504 Colorado Bldg
Denver 2 Colo

Armstrong & Horn Drlg Co
640 Milam Bldg
San Antonio 5 Tex

Arrow Drlg Co
407 Philtower Bldg
Tulsa Okla

Ashby Drlg Co Ltd
738 Meadows Bldg
Dallas Tex

Austin Drlg Co
Box 1240
Seminole Okla

Austin-Dunham Inc
Box 1240
Seminole Okla

Ayers & Burch
Box 1915
Wichita Falls Tex

B B M Drlg Co
673 San Jacinto Bldg
Houston 2 Tex

B J & M Drlg Co Ltd
160 S Fairfax Ave
Los Angeles Calif

B-M Drlg Co Inc
Box 5218
Bossier City La

B & W Drlg Co
308 N Morton
Okmulgee Okla

Badger Drillers Inc
Box 287
Tulsa Okla

Pernie Bailey
2309 Sage Rd
Houston Tex

Baird & Pfeifer Drlg Co
316 Kittredge Bldg
Denver Colo

Baker & Taylor Drlg Co
712 First Natl Bk Bldg
Amarillo Tex

Dorris Ballew Inc
Box 561
Natchez Miss

Bar-Lee Drlg Co
Box 7264
Tulsa Okla

Barnes Core Drlg Co
1350 Roberts Ln
Bakersfield Calif

Barrett Petroleum Co
423 Masonic Bldg
Shawnee Okla

Barry Well Drlg
Fallon Nev

Harry Bass Drlg Co
1403 Magnolia Bldg
Dallas Tex

Bauman Drlg Co
510 Gulf States Bldg
Dallas Tex

Bay City Drlg Co Inc
Box 1389
Bay City Tex

Beard Drlg Co
Box 568
Duncan Okla

Beard Drlg Co
900 NE Military Dr
San Antonio Tex

Beardmore Drlg Co
827 Beacon Bldg
Wichita Kans

Beckman Inc
Box 1524
Muskogee Okla

Bennett & Roberts Drlg Co
Drawer 633
Russell Kans

Bennett Drlg Co
1381 E 26th St
Tulsa 14 Okla

Berry Drlg Co
Box 67
Saint Jo Tex

L E Bever Drlg Co
Box 1164
Snyder Tex

Big Chief Drlg Co
Box 8837
Oklahoma City 14 Okla

Big Seven Drlg Co
311 Wright Bldg
Evansville Ind

Big X Drlg Co Inc
2905 First Natl Bldg
Oklahoma City Okla

Bilbo-Redding Drlg Co Inc
Box 21045
Houston Tex

Black Drlg Co
Box 606
Albany Tex

Black Hills Drlg Co Inc
218½ W Main
Newcastle Wyo

Blackstock & Bradley Drlg Co
810 Braniff Bldg
Oklahoma City 2 Okla

Blount Drlg Co Inc
114 Central Bldg
Midland Tex

Bodard Drlg Co
313 Masonic Bldg
Shawnee Okla

Bolin Oil Co & D H Bolin
1120 Oil & Gas Bldg
Wichita Falls Tex

Boyd & Durst Drlg Cont
Box 329
Alice Tex

Brack Drlg Co Inc
Box 575
Fort Collins Colo

Brack Drilling Co Inc
309-10 Brown Bldg
Wichita Kans

E G Bradham
First Natl Bk Bldg
El Dorado Ark

Brannon & Murray Drlg Co
Box 672
Coleman Tex

Brantly Drlg Co Inc
107 Allen Bldg
Midland Tex

C E Brehm
Box 368
Mt Vernon Ill

Brewster-Bartle Drlg Co Inc
1912 Esperson Bldg
Houston Tex

J E Brogden Sr
Gen Del
Toxey Ala

Zach Brooks Drlg Co
Box 31
El Dorado Ark

Brown & Martin Drlg Co
Box 731
Gainesville Tex

Brown & Thorp Drlg Co
Box 1358
McCamey Tex

Curt Brown Drlg Co
First Natl Bldg
Pawhuska Okla

Layton Brown Drlg Co
Box 185
Woodsboro Tex

Harry T Bryant Drlg Co Ltd
3007 Buffalo Dr
Houston 19 Tex

Bryant-Hayward Drlg Co
Box 4627
Oklahoma City Okla

Buick Drlg Inc
Box 331
St. John Kans

Bullard Drlg Co Inc
Melrose Bldg
Houston Tex

A O Bullock Drlg Co
Box 821
Casper Wyo

Burger Drlg Co
Box 327
Coleman Tex

Butler County Drlg Co
1022 Union Natl Bk
Wichita Kans

Butler-Johnson Inc
Box 306
Shreveport La

Buzzini Drlg Co
541 Milam Bldg
San Antonio 5 Tex

B G Byars Power Drlg Co
318 Citizens Bank Bldg
Tyler Tex

C B Drilling Co
323 Petroleum Bldg
Abilene Tex

CBS Workover Co
1713 N Esperson Bldg
Houston Tex

C N P Drlg Co
Staley Bldg
Wichita Falls Tex

C-P Drlg Co
Box 1821
Pampa Tex

Cactus Drlg Corp of Tex
Box 32
Midland Tex

Calco Drlg Co
1113 Continental Bk Bldg
Fort Worth Tex

Calvert Drlg Inc
204 S Fair St
Olney Ill

Camay Drlg Co
Box 391
Compton Calif

Camay Drlg Co
Rocky Mt Div
Box 1496
Denver Colo

Camden Drlg Co
Sinclair Bldg
Fort Worth Tex

Canadian River Drlg Co
424 Petroleum Bldg
Amarillo Tex

Canter Drlg Co
833 Main St
Mt Vernon Ill

Capitan Drlg Co Inc
Box 671
Odessa Tex

Capitt Drlg Co
814-16 Union Center
Wichita Kans

Frank Caraway Drlg Co
Box 982
San Angelo Tex

Cardinal Drlg Co
420 Fourth St
Bismark N D

Cardinal Drlg Co Inc
1503 Beck Bldg
Shreveport La

Carey & Parker Inc
300 N Jackson St
Odessa Tex

E K Carey Contr
715 Midland Savings Bldg
Denver Colo

Carmack Drlg Co
1008 Mile High Center
Denver Colo

Carpenter-Trant Drlg Co
203 C. A. Johnson B'dg
Denver Colo

Carper Drlg Co Inc
200 Carper Bldg
Artesia N M

Carter Beveridge Drlg Co
816 Howard Ave
New Orleans La

Carter Drlg Co
600 Pet Bldg
Wichita Kans

Carter-Jones Drlg Co
Box 1597
Kilgore Tex

Casner & Bentz
Box 666
Oildale Calif

Catline Dodson Co Inc
Box 8503
Oklahoma City Okla

Central Drlg Co
Box 44
Fairfield Ill

Chambless-Rosen Drlg Co
Box 4294
Oklahoma City Okla

Ford Chapman
Hubbs-Roberson Bldg
Pecos Tex

Cecil Chisler & Son
Route 2
Fairview W Va

Choya Drlg Co
Suite A Ezell Bldg
Midland Tex

Circle Drlg Co Inc
620 Pioneer Bldg
Lake Charles La

Clark Drlg Co
Box 1743
Billings Mont

Clark Fuel Prod Co
Box 473
Mission Tex

R L Bob Clark Drlg Contr
Box 1933
Kermit Tex

Don Clawson
Box 516
Ada Okla

Claypool Drlg Co
St. Elmo Ill

Clegg & Hunt
715 Houston Club Bldg
Houston Tex

Clinch Drlg Co
Box 24
Jackson Miss

Coastal Drlg Co
Box 608
Bakersfield Calif

Colorado Wyoming Drlg Co
1119 Mile High Center
Denver 2 Colo

Columbia Drlg Co
1207 C&I Life Bldg
Houston 2 Tex

Comet Drlg Co
Box 1143 OCS
Lafayette La

Compagnie Industries Metanifere E Affine
PO Box 2012
Tyler Tex

Conrey Drlg Co
328 East Bdwy
Centralia Ill

Continental Drlg Co Inc
413 Shell Bldg
New Orleans La

Continental Shelf Drlg Co
223 Internatl Trade Mart Bldg
New Orleans La

Cook Drlg Co
2305 Continental Life Bldg
Fort Worth Tex

Cooper Drlg Co
902 Staley Bldg
Wichita Falls Tex

R A Cooper Drlg Co
711 Hulman Bldg
Evansville 8 Ind

Coppinger Drlg Inc
320 Union Natl Bank Bldg
Wichita Kans

J M Corbett
6282 E Marshall
Tulsa Okla

Coroco Drlg Co
2807 Mercantile Bk Bldg
Dallas Tex

Crawford Drlg Co
Box 622
Shreveport La

Cree Drlg Co Inc
Box 1821
Pampa Tex

Criswell Drlg Co
Box 253
Arkansas City Kans

Cron & Gracey Corp
Houston Club Bldg
Houston Tex

Crowe Drlg Co
211 Perkins Bldg
Duncan Okla

Crown Rigs Inc
2107 Bank of the Southwest Bldg
Houston Tex

Sam E Crump Drlg Co
408 Union Bldg
Midland Tex

Cummins Drlg Co
Altamont Ill

W C Curry Drlg Co Inc
Box 1528
Longview Tex

Curtis & Lomax Drlg Co
Box 584
Midland Tex

Cyclone Drlg Co
1515 Mile High Center
Denver Colo

D & J Drlg Co
Rt 2 Box 219-A
Okemah Okla

D-K Drlg Co
201 Leggett Bldg
Midland Tex

D & M Drlg Co Inc
Box 247
Great Bend Kans

Clark Dale Drlg Co Inc
Box 788
San Angelo Tex

Danforth Drlg Co
418 Kennedy Bldg
Tulsa Okla

R A Davenport Drlg Contr
211 Perkins Bldg
Duncan Okla

Davidson Drlg Co Inc
1004 Continental Life Bldg
Fort Worth Tex

Edgar Davis Drlg Co
717 Citizens Bk Bldg
Abilene Tex

H Davis & R Thompson Co
1731 28th St
Bakersfield Calif

Davon Drlg Co
Box 1586
Oklahoma City Okla

Delaney Drlg Co
Box 881
Ada Okla

M J Delaney Co
512 Continental Bldg
Dallas 1 Tex

Dellsen Drlg Co
1740 Broadway
Denver Colo

Del Mar Drlg Co
409 Oil Industries Bldg
Corpus Christi Tex

Delta Drlg Co
Box 2012
Tyler Tex

The Denver Co
1904 Great Plains Life Bldg
Lubbock Tex

R V Dillard Drlg Co
Box 992
Duncan Okla

W L Dillier
Box 341
Casey Ill

Dillingham Drlg Co
Box 1346
Alice Tex

Dixie Drlg Co Inc
1712 Commerce Bldg
Houston 2 Tex

Dixilyn Drlg Corp
Box 3427
Odessa Tex

Doak Drlg Co
Box 1108
Bristow Okla

Doc Drlg Corp
Blackie Drlg Co Inc
Neva-Andre Drlg Corp
210 Willow St
Franklin La

Donnell Drlg Co
607 Texas Bank Bldg
Dallas Tex

Douglas Drlg Co
Box 748
Oildale Calif

Drillers Inc
2005 Adolphus Tower
Dallas Tex

Drlg & Explo Co of Delaware Inc
Box 2 Sta H
Los Angeles Calif

Drlg & Prod Co
2907 L St
Bakersfield Calif

Drill Well Oil Co
1502 8th St
Wichita Falls Tex

Dublin-Kiel
1126 Oil and Gas Bldg
Wichita Falls Tex

Dudley & Heath Drlg Co
Box 428
Stillwater Okla

N V Duncan Drlg Co
303 Oil and Gas Bldg
Oklahoma City Okla

Dunnam & Wyant Drlg Co
816 N Jordan
Liberal Kans

Durham Drlg Co Inc
Box 204
Midland Tex

Dyer Drlg Co
Box 338
Casper Wyo

Dykes Drlg Co
200 Petroleum Bldg
San Angelo Tex

E & H Drlg Co
Box 1058
Graham Tex

Eakle & Holder Drlg Co
116 Mulberry St
Evansville Ind

T T Eason & Co
Div of Eason Oil Co
1211 Colcord Bldg
Oklahoma City 2 Okla

Eastland Oil Co
806 Continental Life Bldg
Ft Worth Tex

Edwards & Bissett Inc
Box 298
Almeda Tex

Harry L Edwards Drlg Co
Box 6825
Houston Tex

A W Eggleston Inc
Box 425
Crowley La

Empire Drlg Co
1507 Mercantile Bank Bldg
Dallas Tex

Empire Drlg Co
400 Brown Bldg
Wichita Kans

Empire States Drlg Corp
820 Simms Bldg
Albuquerque N M

Ewing Drlg Co
Box 807
Breckenridge Tex

Exeter Drlg Co
103 Central Bldg
Midland Tex

Exploration Drlg Co
607 Natl Bank of Tulsa
Tulsa Okla

Fairman Drlg Co
Hammersley Fork Pa

Falco Drlg Co Inc
Box 1255
Alice Tex

Falcon Seaboard Drlg Co
Stanolind Bldg
Tulsa Okla

Feeney & Meyers
Box 404
Ardmore Okla

Felderhoff Bros Drlg Co
Box 87
Muenster Tex

Fen-Por Exploration Co Inc
Box 282
Grand Haven Mich

Ferbanta Drlg Co
Box 107
Carmi Ill

Field Drlg Co
1900 Milam Bldg
San Antonio Tex

Jim Fish Drlg Co
Box 655
Iowa Park Tex

Fitzpatrick Drlg Co
803 Wilson Tower
Corpus Christi Tex

Fleeger-Riley Drlg Co Inc
271 Meadows Bldg
Dallas 6 Tex

J B Fletcher Drlg Co
306 Ricou-Brewster Bldg
Shreveport La

Flournoy-Haston Drlg Co Inc
1005 Davis
Ardmore Okla

Folk Drlg Co
614 Main
Yukon Okla

Foree Drlg Co
602 First Natl Bk Bldg
Dallas Tex

Foretich Drlg Co Inc
Box 709
Conroe Tex

Fortenbery Drlg Co Inc
Box 273
Natchez Miss

Fortune Drlg Corp
Petroleum Bldg
San Angelo Tex

C J Foster Drlg Co Inc
Box 657
Richmond Tex

4-J Drlg and Well Serv Co
Box 471
Drumright Okla

Frank Frawley Drlg Co
823 S Detroit
Tulsa 3 Okla

Lloyd R French Co
506 V & J Tower
Midland Tex

Frizzell Drlg Co
108 NW 2nd St
Oklahoma City Okla

Gabbert-Jones Drlg Co
514 Orpheum Bldg
Wichita Kans

C S Garber & Sons Inc
Boyertown Pa

Gardner Bros Drlg Co
1708 Davis Bldg
Dallas Tex

Buster Gardner Drlg Co Inc
Box 281
New Iberia La

Garr-Woolley Oil Co
901 Cravens Bldg
Oklahoma City Okla

Garvey Drlg Co
Route 2
Great Bend Kans

Gary Drlg Co
Box 58
Oil City La

General Geophysical Co
750 Houston Club Bldg
Houston 2 Tex

General Well Drlg Inc
Box 1315
Alice Tex

Gibson Drlg Co
Box 1540
Kilgore Tex

Gilchrist Drlg Co
Box 469
Abilene Tex

Gilger Drlg Co
831 N Esperson Bldg
Houston 2 Tex

Glenn Gillespie & Sons
Box 907
Cushing Okla

Gilmour Drlg Co
Box 1082
Alice Tex

Willard Gladson & Odstocil Bros Drlg
2705 W 35th St
Snyder Tex

C G Glasscock Drlg Co
1601 Wilson Tower
Corpus Christi Tex

Glasscock-Wilson Inc
1604 Beck Bldg
Shreveport La

Glendale Drlg Co
906 Hales Bldg
Oklahoma City Okla

Glenn Drlg Co
38 Kennedy Bldg
Tulsa Okla

F E Gober Drlg Co
3032 Cherry Ave
Long Beach Calif

Gold-Mar Drlg Co
Box 732
Dewar Okla

Goldsmith Drlg Co
Box 750
Duncan Okla

Gordon Drlg Co
1300 N Fancher
Mt Pleasant Mich

Gore Drlg Co
Box 515
Albany Tex

T V Gorman
621 Staley Bldg
Wichita Falls Tex

Gracey-Hellums Corp
410 S Coast Bldg
Houston 2 Tex

Burdette Graham
804 Driscoll Bldg
Corpus Christi Tex

Graham Drillers Inc
908 McBurnett Bldg
San Angelo Tex

Graham Drlg Co
316 Oil & Gas Bldg
Wichita Falls Tex

Graham-Michaelis Oil Co
211 N Broadway
Wichita 7 Kans

Graves Drlg Co
Box 583
Ardmore Okla

Gray Drlg Co
220 Wichita Natl Bank Bldg
Wichita Falls Tex

Great Western Drlg Co
Box 1659
Midland Tex

Green & Dreblow Drlg Co
Box 1057
Bakersfield Calif

Greyhound Drlg Co Inc
Box 4334
Shreveport La

Grey Wolf Drlg Co
1506 Bk of Southwest
Houston Tex

Guadalupe Drlg Co
2505 Princeton Ave
Midland Tex

Roy Guffey Drlg Co
5543 Yale Blvd
Dallas 6 Tex

Gulf Coast Drlg & Explo Inc
Box 787
Laurel Miss

Gulf Coast Drlg Co Inc
712 South St
Houma La

Henry Gwaltney Drlg Co
Box 289
Washington Ind

H & S Drlg Co
Drawer 518
Dewey Okla

The H & S Drlg Co
407 Tri State Ins Bldg
Tulsa Okla

Hack Drlg Co
Box 1636
Abilene Tex

John S Hagestad Drlg Co
3224 Gulf St
Bakersfield Calif

Halbert Drlg Co
3414 Bain Pl
Tyler Tex

Clyde Hall Drlg Co Inc
Box 107 Sta B
Bakersfield Calif

O E Hall Drlg Co
1809 Electric Bldg
Fort Worth Tex

Hamilton-Powell Drlg Co Inc
1220 Hamilton Bldg
Wichita Falls Tex

Hamman Oil & Ref Co
Box 13028
Houston 19 Tex

Hap Drlg Co
First Natl Bldg
Oklahoma City Okla

Harkins & Co
Box 1490
Alice Tex

Harms-Burt Drlg Co
510 Petroleum Bldg
Wichita Kans

Harris Drlg Co
Box 699
Grayville Ill

John W Harris Drlg Co
525 Wichita Natl Bk Bldg
Wichita Falls Tex

C H Hartman
206 Security Bldg
Sapulpa Okla

Harvey Drlg Co Inc
Box 94
Harvey La

Harvey Drlg Co
Box 418
Wichita Falls Tex

John Haseman Inc
419 Wilson Bldg
Corpus Christi Tex

H F Hatcher & Son Drlg Co
Box 164
Smackover Ark

Hatfield Drlg Co Inc
1611 N H St
Midland Tex

Hawkins-Wilkins Prod Co
373 San Jacinto Bldg
Houston Tex

Win Hawkins Drlg Co
373 San Jacinto Bldg
Houston 2 Tex

John Heard & Co Inc
624 S Cheyenne
Tulsa Okla

Helmerich & Payne Inc
First Natl Bldg
Tulsa Okla

Henderson Drlg Corp
N Esperson Bldg
Houston Tex

Henson Drlg Co
Box 2192
Abilene Tex

The Herb Expl Co
342 Lexington Ave
Abilene Tex

Herbert-Smith Cable Tools
109 N Main
Haisington Kans

Herndon Drlg Co
Drawer 489
Tulsa Okla

Herring & Davis
Kennedy Bldg
Tulsa Okla

Maxwell Herring Drlg Corp
Box 1122
Kilgore Tex

B M Hester
Box 2588
Wichita Falls Tex

Hewgley Drlg Co
408 Wilkinson-Foster Bldg
Midland Tex

Hewit-Gulick Drlg Co
240 Silver State Bldg
Denver Colo

Highland Drlg
Box 671
Odessa Tex

Highland Oil Co
Box 263
Jasper Ind

Hill Drlg
Box 532
Conroe Tex

J E Hillier
Box 67
Pleasanton Tex

Hills & Hills Drlg Co
Box 2158
Pampa Tex

C F Hills Drlg Co
Box 2158
Pampa Tex

Hissom Drlg Co
1115 Petroleum Life Bldg
Midland Tex

Holliman Drlg Co
712 Fidelity Union Life Bldg
Dallas Tex

Holmes Drlg Co
1045 San Jacinto Bldg
Houston Tex

W C Holt Drlg Co Inc
103 E 3rd St
Tulsa Okla

R L Horn & Son Drlg Co
Pawnee Okla

Hose-Austin Drlg Corp
Box 1067
Casper Wyo

Houchins Drlg Co
Box 388
Mt Carmel Ill

Houston Oil Well Serv Co
1706 C & I Life Bldg
Houston 2 Tex

H H Howell
801 Milam Bldg
San Antonio Tex

Howell Holloway & Howell
Life of America Bldg
Dallas Tex

Hull Oil Co
214 Panhandle Bldg
Wichita Falls Tex

Hunt Drilling Co Inc
634 Wilson Bldg
Corpus Christi Tex

I J Huval Well Serv Co
Box 261
Pampa Tex

Floyd R Hyer
1230 E 8 St
Okmulgee Okla

Independent Drlg Co
Box 458
Hondo Tex

Indian Drlg Co
Box 42
Tulsa Okla

Donald T Ingling
623 First Natl Bldg
Wichita 2 Kans

Baker B Ingram Inc
Box 1749
Odessa Tex

International Drlg Co
3040 Cherry Ave
Long Beach 7 Calif

Iran Drlg Corp
Box 1528
Longview Tex

Irish Drlg Co Inc
Box 225
Eastland Tex

Iron Drlg Co
1206 Philtower Bldg
Tulsa 3 Okla

Ivy Drlg Co
1705 Burton Way
Bakersfield Calif

J & C Drlg Co
Box 552
Refugio Tex

J & J Drlg Co
Holdenville Okla

J & L Drlg Co Ltd
2005 Adolphus Tower Bldg
Dallas Tex

J E B Drlg Co
750 W 5th St
Ft Worth Tex

J H & S Petroleum Corp
Box 269
Duncan Okla

J M C Drlg Interests
6282 E Marshall
Tulsa Okla

S W Jack Drlg Co
Avonmore Pa

Jackson Drlg Co
Box 1388
Duncan Okla

Charles M Jameson
4171 S Broadway
Englewood Colo

Jennings Drlg Co
612 City Natl Bk Bldg
Wichita Falls Tex

Jet Drlg Co Inc
304 California Bldg
Denver 2 Colo

Jett Drlg Co Inc
Box 1832
Shreveport La

Johns Drlg Co
711 Fair Bldg
Ft Worth Tex

Al Johnson Drlg Co
Rt 12 Box 440
Oklahoma City 10 Okla

Johnson-Bates Drlg Co
Box 425
Konawa Okla

Johnson Drlg & Serv Co
Box 3
Magnolia Ark

Fred Johnson Drlg Co
2790 Cherry Ave
Long Beach Calif

Johnson-Gadbois Drlg Co
Box 9338
Ft Worth Tex

Don Johnston Drlg Co
623 Empire Bldg
Denver Colo

Jonco Drlg Co
Box 1214
Seminole Okla

Buck Jones Drlg Co
Box 1085
McCamey Texas

J E Jones Drlg Co
Box 2218
Midland Texas

Jones Well Serv Co
Box 1547
Abilene Tex

K & E Drlg Inc
719 Union Center Bldg
Wichita 2 Kans

Keating Drlg Co
510 Natl Bk Bldg
Tulsa Okla

Kee & Simpson Drlg Co
417 S Hill St
Los Angeles 13 Calif

K L Kellog & Sons
Box 510
Compton Calif

Kendall-Davis Drlg Co Inc
201 SE 1st St
Evansville Ind

Kent & Preston
425 Sayles Blvd
Abilene Tex

Kerr-McGee Oil Industries Inc
Kerr-McGee Bldg
Oklahoma City Okla

Kersey & Co
Box 305
Artesia N M

Keyes Drlg Co
Box 1108
Roswell N M

Kiefer & Krause Drlg Co Inc
Box 396
Great Bend Kans

Kilroy Drlg Co
Elec Bldg
Houston Tex

Carl B King Drlg Co of Tex
Box 270
Midland Tex

Kingery Drlg Co Inc
Box 97
Saint Jo Tex

King-Phillips Inc
1109 Continental Natl Bk Bldg
Ft Worth Tex

Hugh Kirkpatrick Inc
Box 312
Mission Tex

Kirkwood & Morgan Inc
1105 Alamo Natl Bldg
San Antonio Tex

A F Knappenberger and K & H Drlg Co
Box 1139
Graham Tex

Donald P Knierim
Box 277
Casey Ill

Knight & Williams
Box 1332
Bakersfield Calif

Tom Knight
3086 Garden Ave
Billings Mont

A J Kuenstler Drlg Co
Fitzsimmons Bldg
Alice Tex

L & F Drlg Co
Box 1468
Bakersfield Calif

L & H Drlg Co
3331 Lorraine St
Baton Rouge La

Ralph G Ladd
Box 5
Haskell Okla

La Mance Drlg Co
Box 2686
Midland Tex

Lamar Drlg Corp
Box 4128 Centenary Sta
Shreveport La

Larco Drlg Co
Box 3499
Jackson Miss

Lauderdale Drlg Inc
Box 3
Metropolis Ill

Laughlin-Porter Drlg Co Inc
Petroleum Life Bldg Room 9
Midland Tex

J W Lawrence
Box 942
Conrad Mont

Joe Lawrence Drlg Co
Box 1021
Ada Okla

Leatherwood Drlg Co
Box 925
Jacksboro Tex

Lee Drlg Co
1007 Philtower Bldg
Tulsa Okla

D B Lesh Drlg Co
Box 505
Mattoon Ill

Lewis Bros Inc
320 Mile High Center
Denver 2 Colo

Liberty Drlg Corp
Box 14308
Houston Tex

Ted Lindsay Drlg Contr
Box 190
Mt Vernon Ill

H J Lininger
Box 37
Upper Sandusky Ohio

Lin-Mour Drlg Co
Oil & Gas Bldg
Wichita Falls Tex

Llano Drlg Co
301 V & J Tower Bldg
Midland Tex

Loffland Bros Co
Box 1649
Tulsa Okla

Lofton Drlg Co
707 Oil and Gas Bldg
Wichita Falls Tex

Loggie Bros
311 City Natl Bk Bldg
Wichita Falls Tex

Charles E Long Jr Inc
Box 961
Midland Tex

Low Drlg Co
Box 1112
Cisco Tex

Lowe Drlg Co
Box 832
Midland Tex

Lumac Drlg Co
Box 1589
Lubbock Tex

Lusk Drlg Co
No 11 U-Totem Lane
Houston 24 Tex

M & J Inc
3612 W Wall
Midland Tex

M H O Drlg Co
Box 297
Cut Bank Mont

Mac Drlg Co
Box 2972
Houston Tex

Macrate Prod Co
3341 Cherry Ave
Long Beach Calif

Makin Drlg Co
Box 1628
Hobbs N M

Mallard Drlg Co
1016 Union Natl Bank Bldg
Wichita Kans

R L Manning Co
318 Continental Oil Bldg
Denver Colo

Marcum Drlg Co
Box 761
Ada Okla

Maritzky & Bibby
Box 509
Homer La

M L (Mike) Marrs Drlg Co
Box 985
Drumright Okla

Martin & Holmes Oil Well Serv Co
4730 Ayres
Corpus Christi Tex

Lubie Martin Drlg Co
2052 Harvard
Houston Tex

Maxwell Drlg Co
Box 846
Coleman Tex

McCalman Drlg Co Inc
Box 602
Homer La

McClure Oil Co
Box 147
Alma Mich

McCutchen & Graham
409 Oil and Gas Bldg
Wichita Falls Tex

Gene McCutchin
Box 1585
Dallas Tex

McDaniel & Beecherl Drlg Co
607 Davis Bldg
Dallas Tex

McDonald Drlg Co
1409 Garden City Hwy
Midland Tex

A D McDuffie
Box 807
Wichita Falls Tex

L A McElmurray
104 S Main St
Taylorville Ill

McFann Drlg Co
3901 Cedar Ave
Long Beach 7 Calif

B L McFarland Inc
3612 W Wall
Midland Tex

W H McGarr Ind
Box 826
Coleman Tex

McGoldrick & Watson Drlg Co
213 Beck Bldg
Shreveport La

B M McGraw Drlg Contr
4412 N Western
Oklahoma City Okla

K R McKinney Drlg Contr
503 Commerce Bldg
Okmulgee Okla

McQueen & Stout Drlg Co
1113 Ft Worth Natl Bk Bldg
Ft Worth 2 Tex

Meadows & Walker Drlg Co
500 San Jacinto Bldg
Houston Tex

Melco Drlg Co
Box 1360
Seminole Okla

Mercury Drlg Corp
1205 Beck Bldg
Shreveport La

Meredith & Co
Bk of Southwest Bldg
Houston Tex

Meridian Drlg Co Inc
921 City Natl Bldg
Okla City Okla

Ward S Merrick
Box 971
Ardmore Okla

Mesker Drlg Co
1129 E 15th St
Tulsa Okla

Midland Drlg Co
209 N Big Spring
Midland Tex

Midwestern Drillers Inc
1206 Mid-Continent Bldg
Tulsa 3 Okla

Milam Drlg Co
1814 Alamo Natl Bldg
San Antonio Tex

J Conley Miles Drlg Co
Box 1791
Abilene Texas

Milestone Drlg Co
Box 2745
Midland Tex

Milhoan Drlg Co
Box 948
Tulsa Okla

Miller & York
Box 936
Bakersfield Calif

Miller Bros & Bowling
Box 611
Alice Tex

Miller Drlg Co
Box 24
Jackson Miss

Gene Miller Inc
Box 238
Lawrenceville Ill

J E Miller Drlg Contr
105 Petroleum Bldg
Abilene Tex

Miracle-Fifer Drlg Co
1636 Welton St
Denver 2 Colo

Montgomery Drlg Co
Box 747
El Dorado Ark

Moore & Moore Drlg Co
Box 29
Abilene Tex

Lamar H Moore Drlg Co
Box 29
Abilene Tex

Mora Drlg Co
1908 First Natl Bldg
Tulsa Okla

Moran Bros Inc
1200 Oil & Gas Bldg
Wichita Falls Tex

E W Moran Drlg Co
500 First Natl Bk Bldg
Wichita Falls Tex

Moran Oil Prod & Drlg Corp
Box 1718
Hobbs N M

Dave Morgan Drlg Co
Box 820
Blackwell Okla

Pete Morris Drlg Co
Box 733
Ada Okla

Morrison Drlg Co Inc
Drawer 712
El Dorado Kans

Mountain States Drlg Co Inc
622 Patterson Bldg
Denver Colo

R V Muckelroy & Son
Adams Bldg
Lockhart Tex

Murphy & McKernan
Box 169
Pampa Tex

Neal Drlg Co
Box 423
Victoria Tex

Nebraska Drillers Inc
Box 595
Grand Island Neb

Needham Drlg Co
303 Carper Bldg
Artesia N M

Nemaha Oil Co
Mercantile Bank Bldg
Dallas Texas

Newton Drlg Co
Box 1104
Coalinga Calif

Nichols Drlg Co
Box 1030
Duncan Okla

The Noah Petroleum Co
Box 192
Albion Ill

George Noland Drlg Co Inc
823 S Detroit Ave
Tulsa Okla

Norman Oil Corp
1141 Butternut St
Abilene Tex

Norton Drlg Co
542 Natl Bk of Commerce Bldg
New Orleans 12 La

William A Norton
6516 N W Grand Blvd
Okla City Okla

The Novak Drlg Co
Box 2147
Tulsa Okla

Nowery Drlg Co Inc
5904 Fairfield
Shreveport La

Nuckolls-Bell Drlg Co
First Natl Bldg
Oklahoma City 2 Okla

Nye & Snell Drlg Co
Box 1926
Denver Colo

Ocean Drlg & Expl Co
918 Carondelet Bldg
New Orleans La

The Oil Corp
3105 Leopard St
Corpus Christi Tex

Olds Oil & Chem Corp
Box 72
Mt Carmel Ill

R Olsen
Liberty Bk Bldg
Oklahoma City Okla

R & H Olsen Drlg Co
Liberty Bank Bldg
Oklahoma City Okla

L H & S A Olson Drlg Co
Box 1545
Midland Tex

O'Neal Drlg Co
1314 Oil and Gas Bldg
Fort Worth Tex

Oney Drlg Co
Box 425
Graham Tex

O'Rourke-McGirl Drlg Corp
632 Natl Bk Tul Bldg
Tulsa Okla

The Overby Drlg Co
411 W Shawnee
Nowata Okla

Owen Drlg Co
Box 1423 OCS
Lafayette La

Oxford & Stasney Drlg Co
Box 307
Albany Tex

Paco Petroleum Corp
Box 347
Mt Carmel Ill

Paine Drlg Co
301 Insur-O-Medic Bldg
Dallas Tex

Pan-Tex Drlg Co
316 Henderson Blvd
Kilgore Tex

Parker Drlg Co
418 Natl Bk of Tul Bldg
Tulsa Okla

Payne Bros Drlg Co
1411 10th St
Lawrenceville, Ill

Joe A Payne Drlg Co
1525 Wilson Tower
Corpus Christi Tex

Peak Drlg Co Inc
1019 Central Bldg
Wichita Kans

Pegg Bros Drlg Co
1204 Natl Bk of Commerce Bldg
San Antonio Tex

Penrod Drlg Co
418 Market St
Shreveport La

Pep Drlg Co
1008½ Main St
Mt Vernon Ill

Perforaciones Delta, CA
PO Box 2012
Tyler Tex

Perkins Bros Drlg Co
Box 1232
Duncan Okla

Perrine & Perrine Drlg Contr
Box 87
Salem Ill

Peterson Drlg Co
306 Fairfield Bldg
Shreveport La

Petro Drlg Co Inc
Box 339
Mt Vernon Ill

Petrolex Inc
361 Palmtag
Hollister Calif

H F Pettigrew
836 Republic Natl Bank Bldg
Dallas Tex

Pioneer Drlg Co Inc
Box 2211
Casper Wyo

Louis Pitcock Drlg Co
Box 25
Graham Tex

C C Pollard
Box 65
Fort Stockton Tex

Fred Pool Drlg Contr
Box 172
Abilene Tex

Poteet Wysor & Eckles Inc
First Natl Bk Bldg
Ho'denville Okla

Powell Drlg Co
412 Union Center Bldg
Wichita Kans

Graham Powell Drlg Co
129 N Sycamore St
Centralia Ill

The Power Rig Drlg Co
Box 1436 OCS
Lafayette La

Prime Drlg Co
814-16 Union Center
Wichita Kans

Prince Marine Drlg & Expl Co
990 Houston Club Bldg
Houston Tex

Princeton Mining Co
111 N 7th St
Terre Haute Ind

Progressive Drlg Co Inc
Box 27
Newcastle Wyo

T M Pruett Drlg Contr
Box 303
Centralia Ill

Pyburn Drlg Co
Box 4276
Shreveport La

R F B Drlg Co
Box 235
Wagoner Okla

R-G Drlg Co
403 City Natl Bk Bldg
Wichita Falls Tex

R & M Well Serv & Drlg Co
Rt 2 Box 233
Houston Tex

Ramey Well Service
212 Hamilton Bldg
Wichita Falls Tex

Rankin Karper & Glass
Box 149
Graham Tex

G H Ray Well Serv
Box 68
Cement Okla

Slim Rea Drlg Co
PO Box 399
Abilene Tex

Reading & Bates Inc
1502 Philtower Bldg
Tulsa Okla

Reading & Bates Offshore Drlg Co
1502 Philtower Bldg
Tulsa Okla

Reaves Drlg Co Inc
Box 32
Cushing Okla

Red River Drlg Co
Baker Bldg
Breckenridge Tex

Reed Drlg Co
1209 Atlas Bldg
Tulsa Okla

Gene Reid Drlg Inc
3505 Pierce Rd
Bakersfield Calif

Like having an extra drill string on location

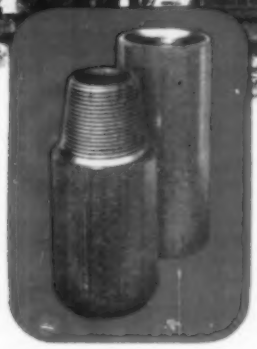
REED
Super Shrink-Grip

Field Replaceable TOOL JOINTS!

A reserve drill string when you need it . . . without a costly inventory of drill pipe equipped with tool joints . . . this, in effect, is what you have with field replaceable Super Shrink-Grip tool joints. With a few extra Super Shrink-Grip tool joints, you can rework your drill string for maximum safety and performance right at the rig with your own labor . . . no costly abandonment of drill pipe or tool joint because the other part is damaged or badly worn . . . no transportation delays or shopping expense.

The versatile field replaceable advantage of the Reed Super Shrink-Grip tool joint makes good economic sense on any location . . . it is doubly important on the isolated rig.

BE SURE TO SPECIFY REED SUPER SHRINK-GRIP TOOL JOINTS . . .



. . . they're right for your rig regardless of its location

1. OFFSHORE . . . where storage space is at a premium, and self-sufficiency at the rig helps cut the enormous operating costs, Reed Super Shrink-Grip tool joints are the dependable answer to drill string economy.

2. FOREIGN . . . far from sources of supply, with the considerable shipping time and expense factors, Reed *field replaceable* Super Shrink-Grip tool joints on foreign rigs become even more vital to economical operations.

3. INACCESSIBLE . . . where the terrain presents difficult transportation problems, every piece of iron carried in must have maximum utility—here again *field-replaceability* of Reed Super Shrink-Grip tool joints makes them ideally suited for the isolated rig.

REED ROLLER BIT COMPANY • HOUSTON 1, TEXAS

Write or wire for complete information . . . or have your Reed man explain the economical and engineering advantages of Reed Tool Joints.

Reliable Drlg Co Inc
3086 Garden Ave
Billings Mont
Reserve Drlg Co Inc
Box 1612
Casper Wyo
Reserve Drlg Co Inc
625 Union Center
Wichita 2 Kans
Rheay & Reynolds Drlg Co
402-406 Petroleum Bldg
Abilene Texas
Rhodes & Hicks Drlg Corp
Box 1395
Alice Tex
Rhodes Drlg Co
Box 239
Abilene Tex
Riceland Corp
503 Enterprise Bldg
Tulsa Okla
Richardson & Stewart Drlg Co
505 Alamo Natl Bldg
San Antonio Tex
Riley & Gammon
509 N Railroad St
Madisonville Ky
George W Riley Inc
Box 826
Odessa Tex
The R W Rine Drlg Co
420 Union Center
Wichita Kan
C M Roberson Drlg Co
418 Market St
Shreveport La
Robinson Bros Drlg Co
Box 430
Borger Tex
Rock Hill Drlg Co
704 Milam Bldg
San Antonio Tex
Rocket Drlg Co
2099 E 27th St
Long Beach Calif
Rocket Drlg Co Inc
352 N Broadway
Wichita Kans
Rocky Mountain Drlg Co
611 Wilshire Blvd
Los Angeles Calif
Roden & McRae Drlg Corp
Box 2286
Casper Wyo
D L Rose Drlg Contr
Box 518
Albany Tex
Dwight M Ross Drlg Co
Hamilton Bldg
Wichita Falls Tex
R Benton Ross Inc
620 Wichita Natl Bk Bldg
Wichita Falls Tex
Don M Rounds Drlg Co Inc
620 Colorado Bldg
Denver Colo
Rowan Drlg Co Inc
Drawer 12247
Ft Worth Tex
B L Rucker Drlg Co
Box 127
Mt Vernon Ill
Ruhl Drlg Co Inc
1621 Bk of Southwest Bldg
Houston 2 Tex
Rupp-Ferguson Oil Co
522 Union Center Bldg
Wichita Kan
Russan Drlg Co
Box 861
Midland Tex
Russell & Russell Drlg & Prod
621 Lindsay St
Gainesville Tex
Paul F Rutledge
Box 2239
Santa Fe N M
Sabre Drlg Co
222 Hughes Bldg
Cushing Okla

St John Drlg Co
Box 639
Ballinger Tex
Salt Dome Prod Co
737 Texas Natl Bk Bldg
Houston 2 Tex
Gordon O Sams Drlg Co
Box 126
Tulsa Okla
San Joaquin Drlg Co Inc
417 S Hill St
Los Angeles 13 Calif
Santa Fe Drlg Co
Box 311
Whittier Calif
Santa Maria Drlg Corp
2875 Cherry Ave
Long Beach 6 Calif
Santa Rosa Drlg Co
Box 633
Apple Valley Calif
Saunders Drlg Inc
Box 5383
Sonora Tex
Schafer Drlg Co
2400 Liberty Bk Bldg
Oklahoma City Okla
Schimmel Drlg Co
2121 Alamo Natl Bldg
San Antonio Tex
Al Schlaikjer
Box 761
Newcastle Wyo
Schoenfeld-Hunter-Kitch Drlg Co
Box 588
Tulsa Okla
Schulz & Brannan Drlg Co
621 Staley Bldg
Wichita Falls Tex
A B See Drlg Co Inc
206 Petroleum Bldg
Abilene Tex
Seiboldt Drlg Co
106½ N Harrison
Cushing Okla
Paul Septer Drlg Co
521-22 Union Natl Bk Bldg
Wichita Kan
Seran & Howard Drlg Co
Box 110
Okemah Okla
Service Drlg Co
515 Kennedy Bldg
Tulsa Okla
Severns Drlg Co Ltd
Suite 1119
639 S Spring St
Los Angeles Calif
Harold Shappell Drlg Co
510 City Natl Bldg
Wichita Falls Tex
Sharp Drlg Co
Box 1271
Midland Tex
Sheets & Walton Drlg Co
Box 152
Breckenridge Tex
Shelley-Miller Drlg Co
115 N Bdwy
Wichita Kans
Sherin Drlg Co Inc
First Natl Bldg
Oklahoma City Okla
Shields Drlg Co Inc
Shields Bldg
Russell Kans
Shields Oil Producers
Shields Bldg
Russell Kans
Shoreline Drlg Co Inc
1203 Beck Bldg
Shreveport La
Shulman Brothers
Box 191
Vandalia Ill
Signal Drlg Co
203 Mayo Bldg
Tulsa Okla

Signal Oilfield Serv
203 Mayo Bldg
Tulsa Okla
Sikes-Burchhalter Drlg Co
300 Oil & Gas Bldg
Wichita Falls Tex
Joe Simpkins
6421 Easton Ave
St Louis 14 Mo
C J Simpson Drlg Co
Box 372
Indiana Pa
Skinner & McDougal Drlg Co
Box 8774
Oklahoma City Okla
Skipper Drlg Co
Box 511
Cushing Okla
Don Slape Drlg Co
Box 432
Olney Ill
Smallwood & Son
3657 E Kiest Blvd
Dallas Tex
Smiley & Little Drlg Co
1635 S E 29th St
Oklahoma City Okla
Smith & Breyer
Suite 154 Meadows Bldg
Dallas 6 Tex
B B Smith Inc
Box 2876
Midland Tex
James Smith Drlg Contr
Box 33
Mertzon Tex
Perl Smith Drlg Co
Box 890
Newcastle Wyo
Sojourner Drlg Corp
Box 686
Abilene Tex
Sonic Drlg & Equip Co Inc
Box 861
Midland Tex
Sooner Drlg Co
412 Federal Natl Bk Bldg
Shawnee Okla
South States Drlg Co
Box 2347
Longview Tex
Southeastern Drlg Corp
901 Employers Insurance Bldg
Dallas Tex
Southern Drlg Co
Box 1015
Newhall Calif
Southern Six Drlg Co Inc
Box 369
Opelousas La
J D Sprecher
P O Box 299
Casper Wyo
Orville Stanford Inc
Box 735
Santa Marie Calif
Star Drlg Co
Box 4822
Oklahoma City Okla
Stephens Drlg Co
820 N. Harvard
Tulsa Okla
Stice Drlg Co
Box 678
Beeville Tex
Jack L Story
Box 1073
Dallas Tex
Stouder Drlg Co
208 S E Riverside Dr
Evansville Ind
Strain Drlg Co
608 Patterson Bldg
Denver Colo
Strait Drlg Inc
Box 90
El Dorado Kans
C W Strotman Drlg Co
620 South 30th St
Mattoon Ill

Stroube Drlg Co
Box 730
Corsicana Tex

The Sun Drlg Co
417 S Hill St
Los Angeles 13 Calif

Sunnyland Contracting Co Inc
Box 388
Rayne La

Sutton Drlg Co
900 N E Military Dr
San Antonio Tex

Symons Drlg Co
Box 546
Houston Tex

Target Drlg Corp
710 Enterprise Bldg
Tulsa Okla

Taylor Expl Co Inc
2118 Welch Ave
Houston Tex

W P Taylor Drlg Co
1429 Bk of Southwest
Houston Tex

Tennant Drlg Co
Rivoli Bldg
Blackwell Okla

Terminal Drlg & Prod Co
1240 Blinn Ave
Wilmington Calif

Tex-Mex Drlg
1211 Fidelity Union Life Bldg
Dallas Tex

Thomas & Billups Drlg
809 Citizens Bank Bldg
Abilene Tex

A W Thompson Inc
Box 2524
Houston Tex

Thompson Expl Drlg Co
Box 1657
Lubbock Tex

Tibbits & Moore Drlg Co
300 Oil and Gas Bldg
Wichita Falls Tex

The Carl Todd Drlg Co
706-08 Union Center
Wichita Kan

Tolson Drlg Co
213 Triangle Bldg
Pawhuska Okla

Trachta Drlg Co
Box 67
Muenster Tex

J C Trahan
1203 Beck Bldg
Shreveport La

Transit Corp
1516 Liberty Bank Bldg
Oklahoma City Okla

Trans-Tex Drlg Co
418 Johnson Bldg
Shreveport La

Trant Drlg Co
Peoples Bank Bldg
Tyler Tex

Travis Drillers Inc
Box 1097
Austin Tex

Treasure State Drlg Co
Box 1712
Great Fall Mont

Tri-County Explo Co Inc
412 Peoples Bank Bldg
Indianapolis 4 Ind

Trimble Drlg Co Inc
Box 459
Magnolia Ark

Trio Drlg Co
3013 Nussbaumer
Dallas 26 Tex

Tri-Service Drlg Co
Box 1785
Midland Tex

Triton Drlg Co Inc
Box 13221
Houston Tex

Troop Drlg Co
Box 145
St Elmo Ill

Troup & Suttles Inc
506 Diamond
Holdenville Okla

True Drlg Co
Box 1612
Casper Wyo

Trusco Drlg Co Inc
210 S Morton
Okmulgee Okla

Tucker Drlg Co
Box 270
San Angelo Tex

Tullous Drlg Co
206 N Big Spring
Midland Tex

Goal Tullous & Co
206 N Big Spring
Midland Tex

Turnbull & Zoch Drlg Co
Box 2248
Corpus Christi Tex

C D Turner Drlg Co
501 Permian Bldg
Big Spring Texas

Two R Drlg Co Inc
712 South St
Houma La

R W Uhl
1401 Washington Blvd
Bartlesville Okla

Rip C Underwood
553 First Natl Bk Bldg
Amarillo Tex

Union Rotary Corp
1104 N Mission St
Mt Pleasant Mich

Unit Drlg Co
Box 599
Bristow Okla

United Drlg Co
Box 986
Longview Tex

United Drlg Co
8750 Hollaway Dr
Los Angeles 46 Calif

Urice Drlg Co
615 Ft Worth Club Bldg
Ft Worth Tex

V S & S Drlg Co
1004 Ridgley Bldg
Springfield Ill

Varner-Neill Drlg Co
1674 N Treadaway
Abilene Tex

W H Varner Drlg Co
1674 N Treadaway
Abilene Tex

Vaught Drlg Co
807 W Golf Course Rd
Midland Tex

Veeder Supply & Dev Co
Box 201
Cherryvale Kans

Vierson & Cochran
Box 280
Okmulgee Okla

W L B Drlg Co
6635 Chocolate Bayou Rd
Houston Tex

Wade Drlg Co
Box 70
Cushing Okla

Wagner & Wyant Drlg Co Inc
414 Petroleum Bldg
Amarillo Tex

Walters Drlg Co Inc
4114 McMillan
Dallas 6 Tex

Rusty Walters Drlg Co
Box 304
Bakersfield Calif

Walton Drlg Co
Box 241
Fairfield Ill

Ward Drlg Co
City Natl Bldg
Wichita Falls Tex

Tommy Ward Drlg Co
1415 Liberty Bk Bldg
Oklahoma City Okla

Warton Drlg Co
Box 2807
Odessa Tex

Carnes W Weaver Drlg Co
326 Gulf Bldg
Houston Tex

C B Webster Drlg Co
609 San Jacinto Bldg
Houston Tex

Webster Drlg Co
424 S Cheyenne
Tulsa Okla

Dick Wegener Drlg Contr
1820 First Natl Bldg
Oklahoma City Okla

Wells Drlg Co
5382 Cherry Ave
Long Beach Calif

West Central Drlg Co
717 Citizens Bk Bldg
Abilene Tex

Western Drlg Co Inc
902 Lubbock Natl Bk Bldg
Lubbock Tex

Western Serv Drlg Co Inc
Box 1392
Longview Tex

Wes-Tex Drlg Co
Box 2058
Abilene Tex

Chester H Westfall Drlg Co
1202 Hunt Bldg
Tulsa Okla

Westlund Drlg Co
Box 197
Midland Tex

Chet Whaley Well Serv Co Inc
6006 Milart St
Houston Tex

Wheless Drlg Co
Box 368
Shreveport La

Wilbanks & Rutter Drlg Co
2200 Scurry St
Big Spring Tex

Wilcox Drlg Co
Box 365
Covington Okla

A W Williams Drlg Co Inc
411 Virginia St
Mobile Ala

Kidd Williams Drlg Corp
205 Kennedy Bldg
Tulsa Okla

Willingdon Drlg & Explo Co Ltd
121 8th Ave W
Calgary Alberta Canada

Walter W Willis
813 Broadway
Mt Vernon Ill

Wilson Drlg Co Inc
Box 933
Jackson Miss

Wolfe Drlg Co
Box 559
Tulsa Okla

Frank T Wolfe
1716 11 St
Wichita Falls Tex

Woodson Prod Co
1333 N 2nd
Abilene Tex

Woolf & Magee
Box 635
Tyler Tex

S P Yates Drlg Co
309 Carper Bldg
Artesia N M

Zapata Off-Shore Co
2218 City Natl Bk Bldg
Houston Tex

Zephyr Drlg Corp
1111 First Natl Bldg
Tulsa Okla

U. S. Contract ROTARY Drilling Rigs

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
ALABAMA						
Baldwin County						
A W Williams Drlg Co Inc	2	dsl-btne	105	Failing 1500	135	2,500/2⅛"
Choctaw County						
J E Brogden Sr	1	btne	145	Beth	145	5,000
Clarke County						
Trans-Tex Drlg Co	2	gas-btne	1350	Unit U-20	1900	13,500
Mobile County						
Zach Brooks Drlg Co	1	dsl	1100	Brwstr N-10	1455	11,000
	7	dsl	1100	Brwstr N-75	1455	11,000
Cook Drlg Co	16	gas-btne	1050	Wlsn Titan	975	12,500
Dixilyn Drlg Corp	5	gas	950	Natl 100	950	14,000
Drlg & Expl of Del Inc	35	gas-gaso	1200	Emsco GB-800	900	12,000
Gulf Coast Drlg & Expl Inc	1	—	900	Natl 80-B	900	12,500
	3	—	900	Natl 80-B	900	12,500
Trans-Tex Drlg Co	1	gas-btne	920	Natl 75-CA	1320	10,500
	3	gas-btne	1400	Natl 110	1900	13,500
ARIZONA						
Apache County						
Fleeger-Riley Drlg Co Inc	1	dsl	325	Beth Twister	600	7,500
ARKANSAS						
Franklin County						
Wolfe Drlg Co	3	gas-btne	536	Natl 50	536	7,500
Garland County						
Walters Drlg Co Inc	13	gas	200	Mayhew 1000	200	600/2⅛"
Lafayette County						
Montgomery Drlg Co	2	gas-btne	415	Brwstr N-55	—	7,500
Miller County						
Arrow Drlg Co	16	gas-elec	840	Emsco	—	10,000
Nevada County						
Trimble Drlg Co Inc	1	dsl-btne	240	Brwstr N-4	310	5,000
Pope County						
B M McGraw Drlg Contr	1	gas-gaso	900	Brwstr N-7	900	8,000
Ouachita County						
W C Allen Drlg Co	2	gas-btne	145	Wlsn Super	78	3,000/3½"
Saline County						
Walters Drlg Co Inc	1	gaso	260	Mayhew 1000	260	1,200/2⅛"
	4	gas	130	Mayhew 1000	130	600/2⅛"
	5	gas	150	Mayhew 1000	150	600/2⅛"
	6	gaso	130	Mayhew 1000	130	300/2⅛"
	7	gas	175	Mayhew 1000	175	900/2⅛"
	8	gas	220	Mayhew 1000	220	600/2⅛"
	9	gaso	130	Mayhew 1000	130	800/2⅛"
	11	gas	150	Mayhew 1000	150	600/2⅛"
	15	gas	500	Mayhew 2000	500	2,500/2⅛"
Union County						
Alan Drlg Co	3	gas	275	Wlsn Mogul	145	3,500
H F Hatcher & Son	1	gas-gaso-btne	225	Crdwll RL-597	165	4,000
	2	gas-gaso-btne	250	Crdwll S-350	250	5,500
Mercury Drlg Corp	1	gas	200	Ideco H-20	200	3,500
Trimble Drlg Co Inc	2	dsl	310	Emsco G8-250	310	6,500
CALIFORNIA						
Fresno County						
Camay Drlg Co	9	gas	1900	Natl 130	1900	16,000
Coastal Drlg Co	3	dsl	1000	Emsco A-800	1650	13,000
L & F Drlg Co	3	gas-dsl	900	Emsco 450	—	8,000
Miller & York	A	dsl	825	Emsco GC-500	825	10,000
	F	dsl	735	Emsco GA-500	550	8,000
Newton Drlg Co	4-40	dsl	320	Emsco GB-250	—	6,000
Santa Maria Drlg Corp	1	gas	850	Wlsn Titan	1200	10,000
	5	gas	750	Wlsn Atlas	900	10,000
Rusty Walters Drlg Co	1	dsl	300	Cooper D-50	300	6,500/4"
	1	dsl	300	Wlsn Mogul	300	7,000/4"
Glen County						
B J & M Drlg Co Ltd	3	gas	450	Natl 50	775	8,500
Kern County						
B J & M Drlg Co Ltd	1	dsl	600	Unit 35-D	400	7,000
	4	dsl	600	Natl 50	600	8,500
Barnes Core Drlg Co	D-10	dsl	450	Custom	450	5,500/3½"
	D-11	dsl	225	Custom	225	3,000/3½"
Camay Drlg Co	2	gas	1080	Wlsn Titan	1000	12,000
Casner & Bentz	1	gas-btne	445	Emsco GA-250	195	4,500
Coastal Drlg Co	4	gas	1000	Emsco GB-800	1050	12,000
H Davis & R H Thompson Co	1	dsl	300	Emsco G-300	300	6,000
	2	dsl	300	Emsco GA-250-T	300	6,000
Douglas Drlg Co	1	btne	125	Emsco	125	2,500
Drlg & Prod Co	2	dsl-gas-gaso	325	Crdwll O	432	6,000
Green & Dreblow Drlg Co	—	dsl	600	Wlsn Giant	600	7,500
John S Hagestad Drlg Co	1	dsl	570	Emsco GB-350	400	7,000
	2	dsl	540	Ideco H30-D	340	4,500
	4	dsl	680	Ideco H-525	440	7,500
Clyde Hall Drlg Co Inc	5	gas-btne	1000	Emsco GB-800	1000	12,000
	8	dsl	600	Beth M-58	600	9,000
Ivy Drlg Co	1	dsl	185	Hopper IG	185	1,500
	2	btne	185	Hopper GF	185	3,000
K L Kellogg & Sons	25	dsl	1480	Natl 75	1480	9,500
	31	gas	1580	Natl 125	1050	16,000
	32	gas	1400	Natl 75	1050	9,500
Knight & Williams	1	dsl	1020	Unit U-35D	340	5,500
L & F Drlg Co	1	gas	300	Emsco GB-250	—	5,000
	2	dsl	500	Emsco GB-250	—	5,000
Loffland Bros Co	131	dsl	1000	—	1000	12,000
Miller & York	1	dsl	275	Frnks Clipper	225	3,500
	G	dsl	275	Emsco G-36	275	5,000
	H	dsl	275	Emsco GA-250	275	5,000
	J-11	dsl	210	Hopper GTA	210	3,500
Newton Drlg Co	1	dsl	300	Ideco H-30	—	4,000
Gene Reid Drlg Inc	1-A	dsl	680	Natl 55	680	9,000
	2	dsl	680	Ideco 525	600	7,000
	6	dsl	340	Unit U-10	340	5,000
	10	dsl	340	Wlsn Mogul	340	4,000
Rocky Mountain Drlg Co	2	gas	1200	Natl 75	900	11,000
	9	gas	1200	Natl 125	1500	20,000
	10	gas	1200	Emsco J-1000	1550	15,000
San Joaquin Drlg Co Inc	3	gas	1260	Wlsn Titan	1300	15,000
	5	gas	1260	Natl 125	1250	15,000
	6	gas	1260	Natl 125	1250	15,000
Los Angeles County						
Camay Drlg Co	1	gas	1075	Emsco J-1000	1000	12,000
	3	gas	855	Natl 75	650	9,000
	5	gas	535	Natl 50	500	7,000
	6	gas	605	Natl 50	500	7,000
	7	gas	535	Emsco G-300	300	6,000
Drlg & Expl Co of Del Inc	31	gas-gaso	1500	Natl 130	1200	18,000
Drlg & Prod Co	1	dsl	325	Crdwll	420	6,000
F E Gober Drlg Co	2	gas	816	Natl 50A	—	7,500
	4	dsl	600	Emsco 500	600	7,500
John S Hagestad Drlg Co	3	dsl	625	Emsco GB-350	400	7,000
International Drlg Co	1	gas	770	Natl 50	450	6,500
	5	gas	1050	Wlsn Titan	1050	12,000
Fred Johnson Drlg Co	—	gas-gaso	1050	Emsco J-1000	1050	12,000
	—	gas-gaso	1050	Wlsn Titan	700	10,000
	—	gas-gaso	800	Emsco G-450	700	6,500
	—	gas-gaso	1400	Wlsn Titan	1050	10,000
Kee & Simpson Drlg Co	1	gas-btne	—	Natl 50	380	6,500
	2	gas-btne	—	Beth 58	420	7,000
K L Kellogg & Sons	18	gas	925	Natl 50	650	7,000
	19	dsl	1200	Natl 75	790	9,500
	27	gas	2000	Natl 100	1050	13,000
	28	dsl	1350	Natl 100	1100	13,000
	34	gas	2475	Natl 125	2475	16,000
	35	dsl	1800	Natl 130	1800	18,000
Loffland Bros Co	141	gas	1000	—	1500	18,000
Macrate Prod Co	2	dsl	175	Ideco HD-30	190	3,500
	7	gas	300	Wgnr Mrhse	250	4,000
McFann Drlg Co	1	gas-btne	550	Natl 50	450	7,000
Rocket Drlg Co	1	gas-btne-prop	555	Emsco G-300	350	4,500
Rocky Mountain Drlg Co	6	gas	1200	Emsco J-1000	1550	15,000
	7	gas	1200	Natl 100	1110	15,000
San Joaquin Drlg Co Inc	4	gas	1260	Natl 75	750	10,500
Santa Fe Drlg Co	13	gas	1050	Wlsn Titan	900	10,000
Southern Drlg Co	1	gas	225	Crdwll H	145	2,500
The Sun Drlg Co	1	dsl	950	Natl 110	1425	12,000
	2	gas	1400	Natl 125	1250	15,000
	3	gas	1500	Natl 125	1250	15,000
	4	elect	750	Natl 110	1100	15,000
Terminal Drlg & Prod Co	1	gas	—	Natl 50	440	7,000
	3	dsl	—	Wlsn Mogul	350	5,000
	4	gas	—	Ideco H-40	460	6,000
	5	dsl	—	Ideco H-40	350	5,000
	14	gas	—	Ideco H-25	105	2,000
	17	dsl	—	Wlsn Mogul	350	5,000

U-36-A PERFORMANCE Best Proof of Design!

U-36-A cuts drilling time

FARNSWORTH, TEXAS — The J. M. Huber Corporation Rig No. R-6, now drilling near this Texas Panhandle community, is consistently cutting well drilling time. Recent wells drilled represent typical performance for this rig — 8050 feet in 24 days and 8301 feet in 22 days. This is two days ahead of average time for the field. Rig is reported to have pulled 7800 feet of 4½" drill pipe with thirteen 6¾ drill collars in 2 hrs. and 20 min. (90-ft. stands). It is a torque converter rig with U-36-A draw works especially designed for economical medium depth drilling, manufactured by Unit Rig & Equipment Co., Tulsa, Oklahoma.

The U-36-A is designed for drilling depths requiring a range of 300 to 600 horsepower with maximum operating economy assured for any drilling depth within the rig's horsepower range.

The fact that the U-36-A is a compact, highly portable unit means additional economy. Both single and double drum models can be trailer mounted.

Important optional features include pump drive, provision for automatic drilling control, and multi-speed rotary transmission.

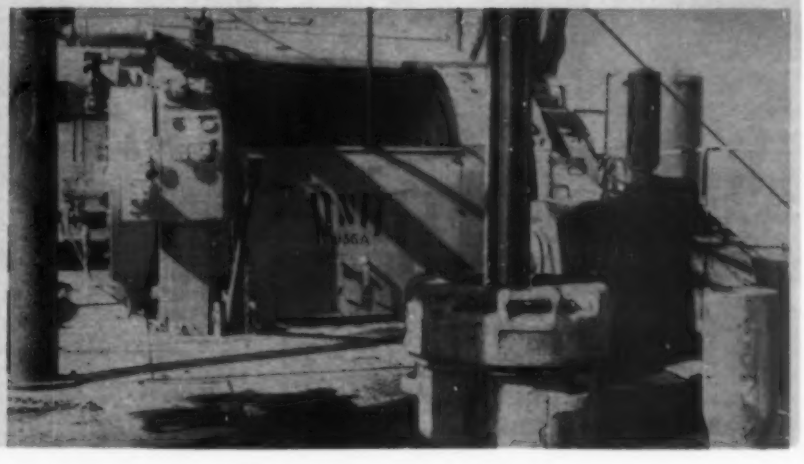
If you're looking for a draw works with a proven record of high operating economy in the shallow-to-medium depth range, contact your nearest Unit Rig representative. He can give you more details on why the U-36-A is drilling wells faster — and cutting drilling costs!

Write Unit Rig in Tulsa for U-36-A Catalog.

UNIT RIG & EQUIPMENT CO. TULSA, OKLAHOMA U.S.A.

Unit Rig equipment sold through these distributors in the U. S. A. — American Pipe & Supply Co. — Bovaird Supply Co. — Houston Oil Field Material Co. Inc. — Industrial Supply Co. Inc. — Iverson Supply Co. — Lucey Products Corporation — Mid-Continent Supply Co. — Norwell — Wilder Supply Co. — Republic Supply Co. of California — United Supply & Mfg. Co.

Export Sales: Mid-Continent Supply Company, 45 Rockefeller Plaza, New York 20, N. Y. Cable — MIDUNITRIG



Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Wells Drlg Co	1	dsl	650	Unit U-10	350	5,000
	2	dsl	325	Wldrp Bltz 622	350	4,500
Monterey County						
Coastal Drlg Co	2	dsl	800	Emsco J-750	1320	11,000
Newton Drlg Co	2	dsl	320	Ideco H-40	—	5,000
Orange County						
K L Kellogg & Sons	23	gas	2090	Natl 75	790	9,500
Santa Fe Drlg Co	3	gas	900	Emsco G-500	440	7,500
	23	dsl	300	Ideco H-40	300	6,000
	25	gas	1050	Natl 55	900	10,000
San Benito County						
Miller & York	C	dsl	550	Emsco GB-350	425	6,500
Petrolex Inc	1	dsl	280	Hopper Bltz	150	5,000/3½"
San Bernardino County						
Santa Rosa Drlg Co	1	prop-gas	155	—	130	2,000
San Joaquin County						
Gene Reid Drlg Inc	4	dsl	680	Ideco H-40	340	5,000
San Mateo County						
B J & M Drlg Co Ltd	2	gas	450	Emsco GA-500	450	7,500
Santa Barbara County						
Casner & Bentz	2	gas-btne	800	Emsco GA-450	550	8,000
Santa Maria Drlg Co	2	gas	400	Wlsn Giant	600	5,000
	4	gas	500	Wlsn Giant	900	7,500
Solano County						
Santa Fe Drlg Co	11	dsl	300	Wgnr-Mrhse	300	6,000
Sutter County						
Gene Reid Drlg Inc	8	dsl	340	Hopper GTA	300	6,000/2⅛"
Ventura County						
Barnes Core Drlg Co	D-6	dsl	225	Custom	225	4,000/3½"
Camay Drlg Co	4	gas	555	Emsco 500	500	7,500
Drlg & Expl Co of Del Inc	23	gas-gaso	1000	Natl 100	900	12,000
	28	gas-gaso	900	Natl 50A	750	9,000
	29	gas-gaso	1500	Natl 34-10	1200	18,000
International Drlg Co	6	dsl	1040	Wlsn Spr Titan	780	12,000
K L Kellogg & Sons	7	gas	2240	Natl 100	1050	13,000
	29	gas	1370	Natl 75	700	9,500
	33	gas	1750	Emsco GB-800	1050	12,000
	36	gas	2475	Natl 125	2475	16,000
Loffland Bros Co	2	gas	1350	—	1350	20,000
	6	gas	1500	—	1400	16,000
	9	gas	1500	—	1400	16,000
	19	gas	1000	—	900	10,000
	111	gas	1000	—	1040	11,000
	132	gas	870	—	900	10,000
	134	gas	800	—	900	10,000
Rocky Mountain Drlg Co	1	gas	1200	Natl 75	900	11,000
	3	gas	1200	Natl 100	900	14,000
	4	gas	1400	Oilwell 96	1750	20,000
	5	gas-dsl	1480	Oilwell 96	1850	20,000
	8	gas	1400	Natl 125	1750	20,000
	12	gas	1480	Natl 125	1850	20,000
	13	gas	1200	Emsco J-1250	1500	20,000
	14	gas	1200	Emsco J-1250	1500	20,000
	15	gas	1200	Emsco J-750	900	11,000
San Joaquin Drlg Co Inc	1	gas	700	Natl 75	750	9,500
	2	gas	1530	Natl 110	1100	15,000
Santa Fe Drlg Co	9	gas	1050	Wlsn Titan	900	10,000
	26	gas	1050	Wlsn Titan	900	10,000
Santa Maria Drlg Corp	3	gas	850	Wlsn Titan	1200	10,000
Severns Drlg Co	1	gas	650	Natl 100	2150	14,000
Orville Stanford Inc	2	gas	650	Wlsn Giant	700	7,500
Terminal Drlg & Prod Co	2	dsl	—	Natl 50A	700	8,500
	6	dsl	—	Emsco GC-500	440	7,000
	18	dsl	—	Ideco H-525	540	8,000
United Drlg Co	1	gas	380	Emsco EDA	450	6,000
Yolo County						
Coastal Drlg Co	1	dsl	1500	Emsco J-1250	1920	16,000
COLORADO						
Adams County						
B F Allison Drlg Co	4	gas-btne	900	Brwstr N-75	900	11,000
Herndon Drlg Co	8	gas	600	Natl 50-A	750	10,500
Denver County						
Baird & Pfeifer Drlg Co	1	dsl	450	Unit U-15	—	9,500
	2	gas	300	Unit U-15	—	7,500
Jackson County						
Lohmann-Johnson Drlg Co Inc	4	dsl	300	Unit U-15	440	5,500
Jefferson County						
Taylor Expl Co Inc	2	gaso	—	Franks	—	1,400
	3	gaso	—	Mayhew	75	1,000
	7	btne	—	Mayhew	—	1,200
	8	btne	—	Failing	—	1,500
Kiowa County						
Wagner & Wyant Drlg Co Inc	1	dsl	300	Unit U-15	450	8,000
La Plata County						
Arapahoe Drlg Co	2	gas-btne	300	Natl T-32	320	6,000
Empire States Drlg Corp	4	gas	225	Wlsn Spr	225	3,000
Loffland Bros Co	13	dsl	1000	—	1200	14,000
Moran Bros Inc	10	gas	550	Emsco GA-350	650	8,500
Nye & Snell Drlg Co	3	dsl	500	Wlsn Atlas	800	11,000
Larimer County						
Dyer Drlg Co	3	dsl	185	Failing 66	300	3,500
Jet Drlg Co Inc	1	dsl	300	Emsco G-500	500	6,500
Logan County						
B F Allison Drlg Co	1	gas-btne	450	Crdwll S	225	5,500
Exploration Drlg Co	6	gas	310	Beth S-50	200	5,500
Lohmann-Johnson Co Inc	1	dsl	300	Natl 50	480	5,500
Western Drlg Co Inc	16	dsl	600	Emsco 350	290	6,000
Zephyr Drlg Corp	12	dsl	258	Beth S-45-E	165	7,000/2⅛"
Moffat County						
Arapahoe Drlg Co	3	gas-btne	300	Wlsn Mogul	275	5,000
Carmack Drlg Co	1	dsl	680	Natl 50-A	450	8,000
	5	gas	400	Natl T-32	320	6,000
Signal Drlg Co	2	dsl	—	Natl 80	900	12,000
Montezuma County						
Exploration Drlg Co	16	gas	625	Natl 75	600	9,000
Loffland Bros Co	139	gas	720	—	900	9,000
Rocket Drlg Co Inc (Kans)	2	dsl	—	—	520	7,500
Montrose County						
Camay Drlg Co Rocky Mt Div	6	dsl	260	Johnson	450	4,500
Morgan County						
Exeter Drlg Co	2	btne	320	Emsco GA-250	250	5,500/4"
Garvey Drlg Co	18	dsl	300	Wlsn Roadair	425	7,000/3½"
Rio Blanco County						
B F Allison Drlg Co	2	gas-btne	675	Unit U-15	675	8,500
Beckman Inc	14(wo)	gas	150	—	175	10,000/2¼"
Camay Drlg Co Rocky Mt Div	2	gas	600	Emsco GA-500	500	7,500
Rowan Drlg Co Inc	24	gas-btne	504	Natl 50	1077	8,500
San Miguel County						
Carmack Drlg Co	4	dsl	472	Natl T-32	320	6,000
Sedgwick County						
Brack Drlg Co Inc	5	dsl	—	—	254	5,500
Washington County						
B F Allison Drlg Co	5	gas-btne	450	Frnks 137	390	5,500
Calvert Drlg Inc	21	dsl	350	Ideco H-35	260	6,500/4"
Garvey Drlg Co	17	dsl	300	Wlsn Roadair	450	12,000/2½"
Herndon Drlg Co	4	gas	480	Emsco G-450	630	7,000
Don Johnston Drlg Co	1	dsl	270	Natl T-12	195	5,000
Weld County						
Dyer Drlg Co	2	gas-gaso	325	Oilwell 64-B	480	7,000
Garvey Drlg Co	12	dsl	300	Wlsn Giant	320	6,000/3½"
Herndon Drlg Co	3	gas	600	Natl 50	750	8,000
Loffland Bros Co	8	gas	1000	—	1200	16,000
	94	dsl	970	—	1275	11,000
Nebraska Drlrs Inc	1	dsl	300	Unit U-15	530	7,500
Yuma County						
Edgar Davis Drlg Co	11	gas-btne	325	Unit U-15	325	7,500
FLORIDA						
Bay County						
A W Williams Drlg Co Inc	1	dsl	186	Joy 300	200	5,500/2⅛"
Lee County						
Dorris Ballew Inc	3	dsl	760	Wlsn Titan	1900	15,000
St. Lucie County						
Dorris Ballew Inc	2	dsl	760	Wlsn Titan	1300	12,500
IDAHO						
Franklin County						
Mountain States Drlg Co Inc	17	dsl	540	Natl T-32	—	6,000
ILLINOIS						
Bond County						
Claypool Drlg Co	R-2	btne	185	Natl N-40	185	4,500
Christain County						
V S & S Drlg Co	2	dsl	—	Wlsn	—	2,400
	4	dsl	—	Beth	—	4,200
Clark County						
Donald P Knierim	3	gas	180	Failing 2500	—	2,500/3½"
Clay County						
Shulman Bros	1	dsl	330	Crdwll S-350	—	5,500
Don Slape Drlg Co	2	dsl	240	Unit U-34	230	4,500

MEMOGRAM

FROM

WEB WILSON OIL TOOLS, INC.

TO ALL OPERATORS AND DRILLING CONTRACTORS:

We are pleased to announce that we have under contract IKE N. SELLEM, who will function as sales consultant, roving representative and advertising adviser for our company. With an admitted worldwide reputation for selling oil tools, we are fortunate indeed to have secured his services. Inasmuch as nothing I might say could be so revealing or interesting as his own story, permit me to introduce IKE N. SELLEM.

W. A. Wilson

President WEB WILSON OIL TOOLS, INC.

WAW-M

WHO I AM, AND WHY IKE N. SELLEM

First of all I am going to let you in on a secret about my very unusual name, IKE N. SELLEM. I feel embarrassed that I haven't explained this to all my oil country friends long ago. You see, that isn't really the name Pa and Ma Sellem gave me. They christened me ICHABOD NIMROD SELLEM, a

good enough name, I guess, for any *ordinary* kid. But as I grew up and got into the selling game and started going to town, everybody saw right off that I was going to be not an *ordinary* salesman, but a *super*-salesman. So it seemed a good idea to change my name a little and give folks some warning of my outstanding ability before I started my sales pitch. That's how come IKE N. SELLEM, and I'm pleased to meet you. I hope you will all be friendly.

I never would have let that Web Wilson outfit talk me into working for them if it hadn't been that a lot of my very best friends kept tellin' me that Web Wilson made the world's best hooks and tongs and elevators, but that they sure needed a man like me to sell 'em. With a name and a reputation like mine, it seemed a natural, so here I am on their payroll, and after looking things over I'm tellin' you "there'll be some changes made."

LANDIS

HILLIARD

GORMAN

My first job was to size up the sales managers: By Landis, VP (Vice President, that is), Ben Hilliard, and Ray Gorman—all good boys, with friends all over, and trying their best to "manage" to sell oil tools. BUT, they just didn't seem to have those two vital virtues which distinguish a *super*-sales-manager, like me, from just ordinary sales managers... Number 1, ABSOLUTE CONFIDENCE in their ability to sell ANYbody ANYthing ANYtime; and Number 2, COURAGE (some folks call it guts) to say to every oil man they call on, "Don't just sit there—buy something!"

See what I mean? I'm not knocking any of those boys, but *you* know as well as I do that a fellow has to have BRASS intestines, a STEELY eye, and a PLASTIC rear end to sell PIG IRON. So I'll have to show those men how to sales-manage; and don't say I didn't warn you.

Next off, I spent a few minutes lookin'

over the advertising that Web Wilson has been doing in the oil magazines, and it didn't take me long to spot something mighty important. They've been printing a lot of those fancy colored pictures showing yellow tongs and hooks and power slips *right on the rig*, and with *real crews* handlin' them. Mighty pretty pictures, but they should have had a master salesman like me standin' on the derrick floor tellin' you just *how* good they are, and *insisting* that you buy 'em.

You know and I know that if IKE N. SELLEM (in person) had been there when you were lookin' at those pretty colored pictures, talkin' low and convincin' and twisting your left arm a little, you would have signed an order—at least before any bones broke. So, from here on in I'll be right alongside when you're lookin' at any Web Wilson "ads"—explainin' and suggestin' and putting on a leetle pressure. And I don't want you to miss *any* ads—look 'em up in the index to be sure—and let's get together often.

Yes sir, President Wilson was real lucky when he signed me up because I can be a lot of help sellin' his yellow iron, and he was smart enough to see it right away. When I told him I would introduce his men such as Johnny Deaver in Louisiana; Merrick Phelps in Houston; and "Export Bob" Eiche to

DEAVER

PHELPS

EICHE

some of my old buddies who are BIG wheels, El Presidente Wilson seemed real pleased. And, when I promised that I'd show Bob Cooper in the Rockies, and George Badger in Canada, and Big Ed Plaugher in California how to "get in and get out with an order"—well he really drooled.

COOPER

BADGER

PLAUGHER

It's going to be wonderful to have a chance to talk to all my friends month by month in these oil magazines—and get paid for doin' it—so look me up in each issue. And I'll judge from your orders for Web Wilson Tools whether you are following my suggestions.

I'll get around to see all of you in person just as fast as I can, and give *you* a chance to talk. But it's a mighty big oil patch, so look for me in your favorite oil magazine in the meantime.

Please direct those orders to me *personally* and I'll see they get the very best attention. And that will also prove to the boss man that...

Ike N. Sellem

P.S. If any of my fans would like my photograph, complete with autograph, just write me and ask for it. Being a big shot, I operate out of the Home Office, so my mailing address is P.O. Box 72096, Los Angeles 2, California.

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Clinton County						
Conrey Drlg Co	1	gas	140	Wlsn Super	140	2,000/3½"
Lauderdale Drlg Inc	1	dsl	300	Brwstr N-4	300	4,500
Perrine & Perrine Drlg Contr	1	btne	—	Crdwll S	185	6,000
T M Pruett Drlg Contr	—	dsl	—	Wlsn Giant	300	6,000
	—	dsl	—	Unit U-15	300	8,000
Shulman Bros	2	dsl	330	Crdwll L	—	3,500
Troop Drlg Co	1	gas-gaso	—	Natl T-20	200	4,500
Coles County						
W L Dillier	1	gas	—	Natl T-12	212	3,000
Henson Drlg Co	6	dsl	250	Unit U-24	150	2,000
Edwards County						
Calvert Drlg Inc	12	dsl	260	Ideco H-30	260	4,500
Fayette County						
D B Lesh Drlg Co	2	dsl	320	—	—	5,500
Franklin County						
C E Brehn	1	dsl	240	Brwstr N-45	—	7,000
Calvert Drlg Inc	16	dsl	260	Ideco H-35	190	5,000
Gallatin County						
Herndon Drlg Co	9	gas	240	Natl T-25	390	4,000
Hamilton County						
C H Brehn	2	dsl	240	Brwstr N-45	—	7,000
Walter W Willis	1	dsl	278	Beth 430S	—	4,500
Jefferson County						
Ted Lindsay	2	dsl	220	Natl T-16	220	5,000
Paco Petroleum Corp	3	dsl	320	Unit U-35	320	7,000
Lawrence County						
Canter Drlg Co	2	dsl	—	—	180	3,000
Walton Drlg Co	1	gas	—	Failing 2500	—	2,000/3½"
	2	gas	—	Failing 2500	—	2,000/3½"
Marion County						
Herndon Drlg Co	5	gas	375	Brwstr N-4	375	4,500
Graham Powell	1	dsl	—	Natl 50	—	6,000
	2	dsl	—	Natl T-12	—	3,200
Montgomery County						
Conrey Drlg Co	2	dsl	175	Wlsn Super	175	2,500/3½"
Ted Lindsay	1	dsl	160	Ideco H-30	160	4,000
Randolph County						
W L Dillier	2	gas	—	Failing 2500	130	2,000
Richland County						
Don Slape Drlg Co	3	dsl	260	Oilwell 64-B	230	5,500
Saline County						
Calvert Drlg Inc	8	dsl	260	Ideco H-30	190	4,500
Eakle & Holder Drlg Co	2	dsl	200	Emsco G-300	—	5,500
Ted Lindsay	3	dsl	220	Crdwll S	160	4,500
Lohmann-Johnson Drlg Co Inc	7	gas	300	Crdwll S	440	4,500
B L Rucker Drlg Co	1	dsl	318	Beth 45-E	—	5,000
Don Slape Drlg Co	1	dsl	260	Oilwell 64-A	230	5,000
Wabash County						
Harris Drlg Co	1	btne	195	Crdwll S	172	4,000
Olds Oil & Chem Corp	1	btne	—	—	200	3,500
Paco Petroleum Corp	1	dsl	320	Natl T-32	320	6,000
	2	btne	200	Wlsn Mogul	165	4,000
Wayne County						
Central Drlg Co	1	dsl	225	Unit U-34	225	4,000
	1	gas	225	Natl 40	185	4,500
Claypool Drlg Co	R-1	btne	225	Natl T-20	185	4,500
D B Lesh Drlg Co	4	gas	450	—	—	7,000
Petro Drlg Co Inc	1	dsl	450	Brwstr N-4	300	6,500
Joe Simpkins	1	dsl	—	Emsco GA-160-T	500	3,500
	3	dsl	500	Natl T-20	500	5,000
White County						
Calvert Drlg Inc	11	dsl	260	Natl T-32	190	5,000
Eakle & Holder Drlg Co	3	dsl	300	Ideco H-30	—	5,500
Ferbanta Drlg Co	1	gas-LPG	250	Crdwll S-40	250	5,500
Harris Drlg Co	3	dsl	285	Natl 50	285	8,500
Herndon Drlg Co	7	gas	409	Natl T-32	559	4,500
The Noah Petroleum Co	1	dsl	300	Brwstr N-4	300	5,500
Pep Drlg Co	1	dsl	330	Beth Breeze	340	5,000
	2	dsl	330	Ideco H-35	340	6,000
Williamson County						
Calvert Drlg Inc	15	dsl	260	Ideco H-35	260	5,000
Moran Bros Inc	14	dsl	275	Natl T-12	300	4,500
INDIANA						
Gibson County						
Walter W Willis	2	dsl	256	Wlsn Mogul	—	4,500
Marion County						
Tri-County Exploration Co Inc	1	gaso	25	Reich Bros	100	1,200/2⅛"
Pike County						
Henry Gwaltney Drlg Co	1	dsl	200	Natl T-12	165	3,000
	1	dsl	200	—	165	3,000
Houchins Drlg Co	1	dsl	120	Natl T-12	120	3,000
Olds Oil & Chem Corp	2	btn	—	—	85	1,500
Posey County						
Advance Drlg Co	3	dsl	380	Beth Breeze	370	5,000/3½"
Harris Drlg Co	2	btne	276	Natl 40	172	4,000
Gene Miller Inc	5	dsl	300	Brwstr N-4	—	4,500
Vigo County						
W L Dillier	3	gas	—	Failing 2500	130	2,000
KANSAS						
Barber County						
Harry Bass Drlg Co	114	gas	570	Crdwll	570	7,000
Capitt Drlg Inc	3	dsl	325	Beth C-50	500	10,000
Gabbert-Jones Drlg Co	3	gas	320	Emsco 300	300	5,000
Garvey Drlg Co	9	dsl	175	Wlsn Giant	296	5,000
Barton County						
Bennett & Roberts Drlg Co	3	dsl	250	Emsco 250	250	5,000
Garvey Drlg Co	11	dsl	175	Wlsn Giant	296	5,000
Harms-Burt Drlg Co	2	dsl	160	Emsco 350	350	6,500
Carl Todd Drlg Co	1	dsl	350	Unit U-15	450	5,600
Butler County						
Morrison Drlg Co Inc	2	dsl	300	Unit U-34	300	5,000
Clark County						
Falcon Seaboard Drlg Co	23	gas-btne	300	Beth Twister	—	6,500
Graham-Michaelis Drlg Co	2	dsl	500	Unit U-15	500	7,000
Unit Drlg Co	3	dsl	700	Natl 50-A	700	6,500
Cowley County						
Badger Drillers Inc	1	dsl	280	Natl T-32	320	6,500
Capitt Drlg Inc	2	dsl	300	Beth S-45	285	5,000
Criswell Drlg Co	1	dsl	300	Unit U-34	275	4,500
Kiefer & Krause Drlg Co Inc	1	dsl	310	Beth MC-250	310	5,000
Elk County						
Veeder Supply & Dev Co	E	dsl	270	Frnks 658	270	3,500
Ellis County						
E K Carey Contr	1	gas-gaso	—	Beth MC-250	—	5,000
	2	gas-gaso	—	Beth	—	4,000
Coppinger Drlg Inc	1	dsl	—	Beth 250	400	4,500
Garvey Drlg Co	8	dsl	175	Wlsn Giant	296	5,000
	14	dsl	175	Wlsn Giant	296	5,000
Iron Drlg Co	7	dsl	268	Emsco GB-160	236	4,500
K & E Drlg Inc	2	dsl	285	Natl T-20	—	5,000
Transit Corp	3	dsl	230	Emsco	—	4,500
Ellsworth County						
Rupp-Ferguson Oil Co	1	dsl	350	Ideco H-35	350	5,000
Finney County						
Garvey Drlg Co	15	dsl	175	Wlsn Giant	296	5,000
Rocket Drlg Co Inc (Kans)	1	dsl	—	—	520	7,500
Graham County						
Empire Drlg Co (Kans)	2	dsl	300	Natl T-32	300	5,000
Graham-Michaelis Drlg Co	6	dsl	275	Beth Breeze	175	4,000
Harms-Burt Drlg Co	1	dsl	150	Emsco 250	250	5,000
Harper County						
Iron Drlg Co	6	dsl	240	Emsco GA-250	268	5,000
Harvey County						
Herndon Drlg Co	10	gas	409	Oilwell 64-A	559	4,500
Haskell County						
Helmerich & Payne Inc	45	dsl	296	Emsco GA-250	311	5,000
Hodgeman County						
Graham-Michaelis Drlg Co	1	dsl	275	Beth Twister	500	6,500
Johnson County						
Garr-Woolley Co	2	gas-btne	255	Emsco 350	—	7,000
Kingman County						
Anschutz Drlg Co Inc	1	dsl	300	Wlsn Giant	280	5,000
Beardmore Drlg Co	1	dsl	300	Natl 50	450	6,000
Brack Drlg Co Inc	2	dsl	325	Unit	—	6,000
D & M Drlg Co Inc	2	gas-btne	225	Brwstr N-4	280	5,000
Garvey Drlg Co	3	dsl	175	Unit U-15	296	5,000
	5	dsl	175	Unit U-15	296	5,000
Graham-Michaelis Drlg Co	4	dsl	500	Unit U-15	500	7,000
Herndon Drlg Co	1	gas	409	Oilwell 64-B	559	6,000
Prime Drlg Co	5	dsl	300	Natl T-20	300	5,000
Kiowa County						
Falcon Seaboard Drlg Co	26	dsl	225	Beth Twister	—	6,500
The R W Rine Drlg Co	3	gas-btne	520	Unit U-15	600	7,500
McPherson County						
Donald T Ingling	2	btne	—	Brwstr CR-300	270	4,000
Mallard Drlg Co	1	dsl	285	Emsco G-300	285	4,000

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Meade County						
D & M Drlg Co Inc	1	gas-btne	550	Natl 50	550	7,500
Danforth Drlg Co	1	dsl	240	Ideco H-30	350	5,000
Midwestern Drillers Inc	5	dsl	300	Unit U-15	450	6,500
Nye & Snell Drlg Co	1	gas	375	Oilwell 66	550	6,000
R W Rine Drlg Co	4	dsl	520	Brwstr N-75	700	8,500
Morton County						
Gabbert-Jones Drlg Co	2	gas	450	Emsco 350	450	7,000
Graham-Michaelis Drlg Co	3	dsl	300	Crdwll S	175	5,000
Nye & Snell Drlg Co	2	dsl	320	Wisn M-46	320	5,000
	4	dsl	320	Unit U-15	320	6,000
R W Rine Drlg Co	1	gas-btne	620	Unit U-15	600	7,500
Norton County						
Brack Drlg Co Inc	1	dsl	250	Unit	—	4,000
Lohmann-Johnson Drlg Co Inc	3	gas	300	Natl 50	450	5,500
Pawnee County						
Gabbert-Jones Drlg Co	1	gas	320	Emsco 300	300	5,000
Transit Corp	4	dsl	250	Emsco	—	4,500
Pratt County						
Falcon Seaboard Drlg Co	MA-1	gas-btne	300	Unit U-35	—	6,500
Rice County						
Bennett & Roberts Drlg Co	2	dsl	250	Emsco 250	250	6,000/3½"
Rooks County						
K & E Drlg Inc	1	dsl	285	Oilwell T-52	—	6,000
Lohmann-Johnson Drlg Co Inc	8	dsl	300	Natl 32	550	7,500
Prime Drlg Co	3	dsl	275	Unit U-34	285	4,500
Reserve Drlg Co Inc (Kans)	3	dsl	220	Natl T-32	—	5,500
Shields Drlg Co Inc	2	dsl	300	Beth C-50	300	8,000
Transit Corp	2	dsl	230	Emsco	—	4,500
Veeder Supply & Dev Co	D	dsl	280	Natl T-25	300	4,500
Russell County						
Bennett & Roberts Drlg Co	1	dsl	250	Emsco 250	250	5,000
Sedgwick County						
Garvey Drlg Co	10	dsl	175	Wisn Giant	296	5,000
Prime Drlg Co	2	dsl	300	Beth S-45	300	5,000
Stafford County						
Buick Drlg Inc	2	dsl	300	Wilson	—	4,500
Shelley-Miller Drlg Co	1	dsl	—	Wisn	—	5,500
Sumner County						
Beardmore Drlg Co	2	dsl	300	Emsco 300	320	4,000
Falcon Seaboard Drlg Co	27	gas-btne	185	Unit U-34	—	5,000
Graham-Michaelis Drlg Co	8	dsl	400	Crdwll D	400	5,000
Herndon Drlg Co	6	gas	409	Natl T-32	559	6,000
Trego County						
Powell Drlg Co	1	dsl	—	Emsco GB-350	350	6,500
KENTUCKY						
Henderson County						
Big Seven Drlg Co	1	dsl	300	Emsco GB	300	4,500
Delta Drlg Co	12	dsl	260	Brwstr N-4	420	5,000
General Geophysical Co	27	dsl	—	—	400	4,500
Kendall-Davis Drlg Co Inc	2	dsl	300	Crdwll S	3000	4,000
D B Lesh Drlg Co	1	dsl	200	—	—	4,000
Hopkins County						
Eakle & Holder Drlg Co	1	dsl	200	Brwstr N-4	—	5,500
Lohmann-Johnson Drlg Co Inc	6	gas	300	Crdwll S	440	4,500
Lee County						
Overby Drlg Co	2	dsl-btne	250	Mayhew 2000	—	2,500
Madison County						
D B Lesh Drlg Co	3	dsl	200	—	—	4,000
McLean County						
Stouder Drlg Co	1	LPG	200	Natl 40	160	4,500
Webster County						
Eakle & Holder Drlg Co	4	dsl	300	Natl T-20	—	5,500
Stouder Drlg Co	2	LPG	200	Natl T-12	160	4,000
LOUISIANA						
Acadia Parish						
Bullard Drlg Co Inc	3	stm	1000+	Ideco Big Gnt	1000+	16,000
Drlg & Expl Co of Del Inc	36	stm	1400	Natl 34-8	—	15,000
Falcon Seaboard Drlg Co	2	stm	1200+	Ideco Gnt	—	25,000
	30	stm	1200+	Natl 3410	—	25,000
Gilger Drlg Co	3	stm	800+	Emsco	1000+	11,000
Glasscock-Wilson Inc	9	gas	1200	Natl 80-B	800	12,500
	11	gas	1050	Natl 55	800	10,500
	12	gas	1300	Natl 110	1200	15,000
Kilroy Drlg Co	4	gas	450	Ideco 7-11	1200	12,000
Loffland Bros Co	76	stm	—	—	—	18,000
Owen Drlg Co	4	stm	1000+	Emsco UBLS-54	—	14,000
Southern Six Drlg Co Inc	6	—	—	—	—	15,000
Wm Hawkins Drlg Co	4	stm	1000+	Natl 34-10FE	1200+	16,000
Allen Parish						
Owen Drlg Co	8	dsl	1040	Natl 50	1040	9,500
	9	stm	740	Ideco Big Gnt	540	16,000
Penrod Drlg Co	7	dsl	—	—	730	9,000
	27	dsl	—	—	1095	11,000
Ascension Parish						
Brewster-Bartle Drlg Co Inc	10	gas	—	Oilwell 76	700	11,000
Crown Rigs Inc	6	gas	900	Beth MC-450	600	10,000
L & H Drlg Co	1	gas-dsl	350	Hou Prt CT5	350	8,000
Assumption Parish						
Gracey-Hellums Corp	2	stm	1200	Natl 23-9FE	1200	15,000
Grey Wolf Drlg Co	1	gas-btne	945	Emsco GB-800	—	12,500
Loffland Bros Co	57	stm	—	—	—	15,000
Owen Drlg Co	7	stm	1000+	Emsco	—	16,000
Penrod Drlg Co	16	gas-btne	—	—	1500	15,000
W P Taylor Drlg Co	1	gas	—	Emsco	1000	13,000
Wheless Drlg Co	7	stm	1000+	Emsco UBLS	1000+	15,000
Beauregard Parish						
Circle Drlg Co Inc	4	gas-btne	800	Natl 75	960	11,000
Gilger Drlg Co	2	gas-btne	400	Beth 400	400	7,500
Meredith & Co	4	gas-gaso-btne	—	Brwstr N-75	850	11,500
Penrod Drlg Co	22	dsl	—	—	600	9,000
	30	gas-btne	—	Brwstr N-7	—	10,000
The Power Rig Drlg Co	2	gas-gaso-btne	600	Unit U-15	—	9,500
	3	gas-btne	1000	Ideco 800	—	12,000
Bienville Parish						
Nowery Drlg Co Inc	2	dsl	6000	Unit U-15	600	8,000
Bossier Parish						
Butler-Johnson Inc	1	gas-btne	650	Brwstr N-75	1005	10,000
Cardinal Drlg Co Inc	1	dsl	450	Ideco H-35	400	7,000
	2	dsl	450	Ideco H-30	400	6,000
Glenn Drlg Co	1	dsl	200	Unit U-10	300	5,000
Greyhound Drlg Co Inc	1	dsl	300	Brwstr N-4	280	5,500
H & S Drlg Co	1	gas-btne	1000	Wisn Titan	1000	12,000
Jet Drlg Co Inc	3	dsl	1000	Brwstr N-75	700	11,000
Johnson Drlg & Serv Co	2	dsl	225	Beth Twister	300	6,500
Montgomery Drlg Co	1	gas-btne	700	Emsco GA-500	—	9,500
Pyburn Drlg Co	2	gas	250	Wisn	800	9,000
Caddo Parish						
W C Allen Drlg Co	1	gas-btne	145	Wisn Super	78	3,000/3½"
W C Curry Drlg Co Inc	4	gas	145	Ideco 35	145	4,000/2⅞"
	5	gas	145	Wisn Super	145	3,000/2⅞"
Gary Drlg Co	1	btne	—	—	90	2,000
	2	btne	—	—	118	4,000
McGoldrick & Watson Drlg Co	1	btne	145	Brwstr N-3	140	3,500
Nowery Drlg Co Inc	3	dsl	300	Natl T-32	3000	6,500
Tex-Mex Drlg Co	11	stm	—	—	1000+	12,000
Calcasieu Parish						
Pernie Bailey	1	gas	650	TIW CT-5	—	9,000
Cron & Gracey Corp	4	dsl	1450	Oilwell 96	1290	15,000
Gilger Drlg Co	1	gas-btne	225	Wisn 370	—	6,000
Mac Drlg Co	5	gas-gaso-btne	275	Beth S-45	450	5,000
Norton Drlg Co	Bge 5	dsl	1200	Oilwell 96	1200	17,000
Owen Drlg Co	1	stm	540	Ideco Big Gnt	—	15,000
	3	gas	900	Ideco M-1000	—	12,500
Penrod Drlg Co	43	dsl	—	—	730	9,000
C B Webster Drlg Co	3	gas	900	Emsco J-1250	1300	15,000
	4	stm	1200	Natl FE-34-10	1200+	15,000
Cameron Parish						
Clegg & Hunt	8	dsl	—	—	1275	18,000
Crown Rigs Inc	Bge 1	dsl	1200	Beth 1013	1200	15,000
Delta Drlg Co	31	gas-btne	1020	Emsco J-1000	1260	13,000
Dixilyn Drlg Corp	7	—	2250	Natl 110	2250	17,500
Harry L Edwards Drlg Co	6	stm	1000+	Oilwell 9-P	1000+	15,000
	Bge 10	dsl	—	Ideco PR-1050	—	16,000
Falcon Seaboard Drlg Co	4	stm	1000+	Wheeland	—	17,000
Loffland Bros Co	41	stm	—	—	—	15,000
	59	stm	—	—	—	15,000
	95	stm	—	—	—	18,000
Mac Drlg Co	10	gas-btne	1000	Wisn Titan	1300	15,000
	12	stm	500	Natl 23-9-FED	1000+	15,000
Southeastern Drlg Corp	14-Bge 1	dsl	1200	Oilwell 96	1600	18,000
Carnes W Weaver Drlg Co	3	gas-btne	700	Oilwell	—	10,500
Wheless Drlg Co	Bge 12	gas-btne	1200	Natl 80	800	12,000
Wm Hawkins Drlg Co	1	stm	1000+	Alco BIW 14	1200+	16,000
	3	stm	1000+	Emsco UBLS54	1200+	14,000
Cameron (Offshore) Parish						
Kerr-McGee Oil Ind Inc	46	dsl-elec	2000	Emsco EDA	1250	20,000

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Loffland Bros Co	81	dsl-elec	1150	—	1200	17,000
	127	dsl	1765	—	1525	18,000
	149	dsl	500	—	1500	20,000
Ocean Drlg & Expl Co	Mr Charlie	dsl-elec	1000	Emsco EDA	1500	20,000
	Jhn Hayward	dsl-elec	1000	Emsco ECA	1200	15,000
	Marg	dsl-elec	1000	Emsco EDE	1500	20,000
Rowan Drlg Co Inc	17	dsl	2100	Natl 125	1305	15,000
Catahoula Parish						
Dorris Ballew Inc	6	dsl	380	Unit U-15	600	7,500
Penrod Drlg Co	9	dsl	—	—	385	6,000
Woolf & Magee Inc	7	gas-btne	800	Beth MC-450	800	11,000
Claiborne Parish						
Zach Brooks Drlg Co	2	dsl	750	Brwstr N-7	1182	8,500
Cook Drlg Co	17	gas-btne	670	Wlsn Atlas	650	10,000
Delta Drlg Co	8	stm	750	Ideco Supr-Duty	1200	12,000
Maritzky & Bibby	1	gas	—	Brwstr	185	5,000
McCalman Drlg Co Inc	1	dsl	—	Brwstr N-4	300	5,500
Nichols Drlg Co Inc	5	gas-btne	1350	Natl 75-CA	1350	11,000
Penrod Drlg Co	21	dsl	—	—	385	6,000
C M Roberson Drlg Co	1	gas-btne	400	Brwstr N-45	400	7,300
Wheless Drlg Co	1	gas-btne	600	Emsco G-42	600	7,500
	5	stm	900	Emsco UBLS-54	1000+	11,000
	Bge 10	gas-btne	900	Brwstr N-7	700	9,500
	13	gas-btne	700	Emsco J-750	750	10,500
Woolf & Magee Inc	5	gas-btne	800	Beth MC-450	—	11,000
Concordia Parish						
Jett Drlg Co Inc	3	dsl	—	—	600	7,500
	7	dsl	—	—	500	7,500
Peterson Drlg Co	1	gas	500	Crdwll O	735	10,000
	4	dsl	500	Unit U-15	600	8,500
	5	gas	320	Crdwll S	350	6,000
De Soto Parish						
Glenn Drlg Co	2	dsl	280	Unit U-15	450	8,500
East Baton Rouge Parish						
Pernie Bailey	2	gas	800	Unit U-40	—	11,000
Evangeline Parish						
A W Eggleston Inc	1	gas-btne	410	Natl Ideal 60	560	9,800
	2	gas-btne	500	Ideco M-10,000	627	9,800
Franklin Parish						
Ferbanta Drlg Co	1S	gas	250	Crdwll S-140	250	4,500
J B Fletcher Drlg Co	1	gas-btne	—	Unit U-15	600	7,500
Iberia Parish						
Continental Drlg Co	6	dsl	650	Emsco GB-500	650	11,000
Harry L Edwards Drlg Co	4	stm	1000+	Alco BIW 12	1000+	15,000
Gulf Coast Drlg & Expl Inc	2	—	1200	Natl 110	1200	14,000
Loffland Bros Co	47	stm	—	—	—	15,000
Penrod Drlg Co	28	dsl	—	—	820	9,000
Ruhl Drlg Co Inc	2	stm	—	Natl Ideal	—	13,500
Southeastern Drlg Corp	9-Bge 2	dsl	1200	Oilwell 96	1600	18,000
C B Webster Drlg Co	6	stm	1100	Emsco ECA-10½	1200+	15,000
Wheless Drlg Co	Bge 6	gas-btne	1000	Wlsn Titan	1000	12,000
Iberville Parish						
Dorris Ballew Inc	4	dsl	760	Wlsn Titan	1900	15,000
Frank Frawley Drlg Co	1	stm	—	Ideco Big Gnt	—	13,000
Hawkins-Wilkins Prod Co	1	stm	1000+	Natl 34-10-FE	1200+	15,000
Owen Drlg Co	6	gas	555	Unit U-15	—	8,000
Penrod Drlg Co	4	gas-btne	—	—	1425	15,000
Southern Six Drlg Co Inc	1	stm	1000+	—	1000+	14,000
	2	stm	1000+	—	1000+	14,000
Sunnyland Contr Co Inc	3	stm	—	Emsco UBLS	724	12,000
	8	gas-gaso	—	Crdwll D	312	8,000
Jefferson Parish						
Delta Drlg Co	16	dsl	1200	Beth MC-950	1400	15,000
	35	gas-btne	1200	Emsco J-1100	1200	15,000
	37	dsl	900	Beth MC-950	1400	15,000
Doc Drlg Corp Blackie Drlg Co Inc Neva-Andre Drlg Corp	Bge DOC	dsl	1500	Beth Tornado	1500	15,000
	Bge NEVA	dsl	1500	Beth 1013	1500	18,000
Hawkins-Wilkins Prod Co	2	dsl	1000	Ideco PR 1050	1400	15,000
Loffland Bros Co	45	stm	—	—	—	15,000
	63	stm	—	—	—	18,000
Reading & Bates Inc	1	gas-btne	970	Natl 100	1200	12,500
Shoreline Drlg Co Inc	Bge 3	dsl	1650	Unit U-20	1650	15,000
C B Webster Drlg Co	7	stm	1600	Emsco ECA-10½	1200+	15,000
Jefferson (Offshore) Parish						
Loffland Bros Co	65	dsl	1420	—	1510	18,000
Jefferson Davis Parish						
Bullard Drlg Co Inc	1	stm	1000+	Natl 34-10 FE	1000+	16,000
Circle Drlg Co Inc	2	gas-btne	800	Natl N-75	900	11,000
Delta Drlg Co	32	stm	1200	Ideco Big Gnt	1690	15,000
	Bge 14	dsl-elec	1600	Emsco ECA	2325	18,000
	Bge 18	stm	1800	Emsco ED	750	18,000
Harry L Edwards Drlg Co	5	stm	1000+	Natl 23-10½ FE	1000+	16,000
	7	stm	1000+	Alco BIW 12	1000+	15,000
Gilger Drlg Co	5	stm	900+	EmscoUBLS-54	1000+	14,000
Penrod Drlg Co	23	dsl	—	—	730	9,000
Wheless Drlg Co	4	stm	1000+	EmscoUBLS-54	1000+	12,000
Lafayette Parish						
Clegg & Hunt	4	stm	—	Ideco Big Gnt	—	15,000
Delta Drlg Co	14	stm	900	Ideco Big Gnt	1690	15,000
Falcon Seaboard Drlg Co	1	stm	1200+	Emsco ECA	—	25,000
	3	stm	1000+	Alco BIW 12	—	17,000
	11	stm	1000+	Alco BIW 12	—	17,000
	12	stm	1200	Alco BIW 12	—	25,000
Gilger Drlg Co	4	stm	900+	Emsco	1000+	14,000
Win Hawkins Drlg Co	2	gas-btne	—	Unit U-15	600	7,500
Lafourche Parish						
Brewster-Bartle Drlg Co Inc	2	dsl	—	Oilwell 96	1500	16,000
	6	dsl	—	Oilwell H-96	1500	—
Circle Drlg Co Inc	3	gas-btne	1200	Natl 125	1400	15,000
	5	gas-btne	1200	Natl 12	1440	15,000
Continental Drlg Co	7	dsl	1200	Emsco GB-800	1200	14,000
Delta Drlg Co	5	gas-btne	900	Natl 100	800	12,000
Dixie Drlg Co Inc	2	dsl	—	Beth	—	17,500
	3	gas	—	Beth	—	17,500
C G Glasscock Drlg Co	2	dsl	1200	Natl 80	—	14,000
Win Hawkins Drlg Co	5	dsl	1700	Ideco PR-1050	1400	14,000
Howell Holloway & Howell	3	dsl	—	Emsco	696	12,000
	7	stm	—	Emsco	600	14,000
	8	stm	—	Alco DN T-12	500	12,500
Loffland Bros Co	83	stm	—	—	—	15,000
	84	stm	—	—	—	18,000
	130	dsl	1200	—	1400	18,000
	133	dsl	2000	—	1400	18,000
Mac Drlg Co	3	stm	600	Natl 23-9-S	1000+	15,000
Norton Drlg Co	Bge 4	gas-btne	1400	Emsco J-1250	1500	17,000
Penrod Drlg Co	36	stm	—	—	—	14,000
Rowan Drlg Co Inc	Bge 1	dsl-elec	1600	Emsco ECA	2475	18,000
	Bge 3	dsl-elec	2150	Emsco EDA	3455	20,000
	Bge 20	dsl	1120	Natl 75	1300	12,000
Shoreline Drlg Co Inc	Bge 4	dsl	1860	Unit U-1220	1860	20,000
Carnes W Weaver Drlg Co	Bge 1	dsl	2000	Oilwell 96	1700	16,000
Wheless Drlg Co	Bge 8	dsl	1300	Natl 130	1300	16,000
	Bge 9	dsl	1300	Natl 130	1300	16,000
	Bge 11	gas-btne	1200	Emsco J-1250	1250	13,500
Lafourche (Offshore) Parish						
Dixilyn Drlg Corp	6	dsl	1500	Natl 130	1500	20,000
Reading & Bates Offsh Drlg Co	2	dsl	3300	Natl 130	2200	20,000
Rowan Drlg Co Inc	8	dsl	1920	Natl 125	2340	18,000
	11	dsl	2250	Unit U-1220	2400	20,000
Lake Arthur Parish						
Drlg & Expl Co of Del Inc	32	stm	1400	Emsco ECA	—	15,000
LaSalle Parish						
Woolf & Magee Inc	12	gas-btne	275	Beth S-45	275	8,000 2⅛
Plaquemines Parish						
Brewster-Bartle Drlg Co Inc	12	dsl	—	Oilwell 96	1500	16,000
Cardinal Drlg Co Inc	3	dsl	1200	Natl 125	1200	20,000
Clinch Drlg Co	1	dsl	—	Emsco GA-350	350	8,500
Cron & Gracey Corp	2	stm	—	Natl 23-9-FEC	—	15,000
	3	dsl	—	TIW CT-5	520	8,000
Delta Drlg Co	20	gas-btne	1520	Emsco J-1250	1250	15,000
Buster Gardner Drlg Co Inc	1	dsl	—	Beth M-58	—	9,500
	2	dsl	—	Beth Tornado	—	15,000
Gracey-Hellums Corp	1	stm	1000	Natl 34-10FE	1200	15,000
Gulf Coast Drlg Co Inc	1	gas-dsl	1200	Beth MC-950	1200	15,000
Harvey Drilling Co Inc	1	dsl	500	Franks SAL5000	500	7,500/3½"
Loffland Bros Co	48	dsl-elec	1150	—	1026	16,000
	68	dsl	1450	—	1500	18,000
	69	dsl	1120	—	1050	18,000
	128	dsl	1150	—	1200	18,000
B L McFarland Drlg Corp	Bge 1	dsl	700	Brwstr N-75	—	12,000
Norton Drlg Co	Bge 1	gas-btne	800	TIW CT-5	—	9,000
	Bge 6	dsl	1400	Emsco J-1250	1200	17,000
Penrod Drlg Co	33	gas-btne	—	—	1230	12,000
	34	dsl	—	—	1095	12,000
	37	dsl	—	—	1000	12,000
	44	dsl-elec	—	—	1400	18,000
	47	dsl-elec	1250	Emsco EDA	1250	20,000
Prince Marine Drlg & Exp Co	2	dsl	1850	Oilwell 96	1500	16,000
	6	dsl	1500	Oilwell 96	1500	15,000
Rowan Drlg Co Inc	Bge 6	dsl-elec	1200	Emsco ED	2800	18,000
	Bge 13	dsl-elec	1700	Emsco FCA	2700	18,000

22-month test showed
substantial savings from using

MISSION MUD MONARCH VALVES

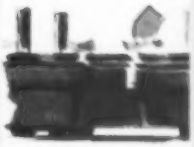
OVER 2400 VALVES AND SEATS were used by a large operator during a 22-month test comparing the cost of Mission Mud Monarch fluid end mud pump valves and seats with the competitive make he was using at the beginning of the test. Due to the size and duration of the test, results may be considered conclusive for the 2500-psi pressures and other conditions encountered.

This test showed that Mission Mud Monarch Valves and Seats cost less than half as much per thousand feet of hole as the competitive make.

Why don't you make a competitive test yourself to find out just *how much* Mud Monarch Valves can save *you?* Many operators have reported important savings at normal pump pressures, even though the advantage of using Mud Monarch Valves becomes greater as pressures become higher. Arrange with your Mission Representative for a competitive test.

COMPETITIVE VALVES

cost more than $36 per thousand feet of hole.



Nothing but the finest will bear the name of

MISSION MANUFACTURING CO.

MUD MONARCH VALVES

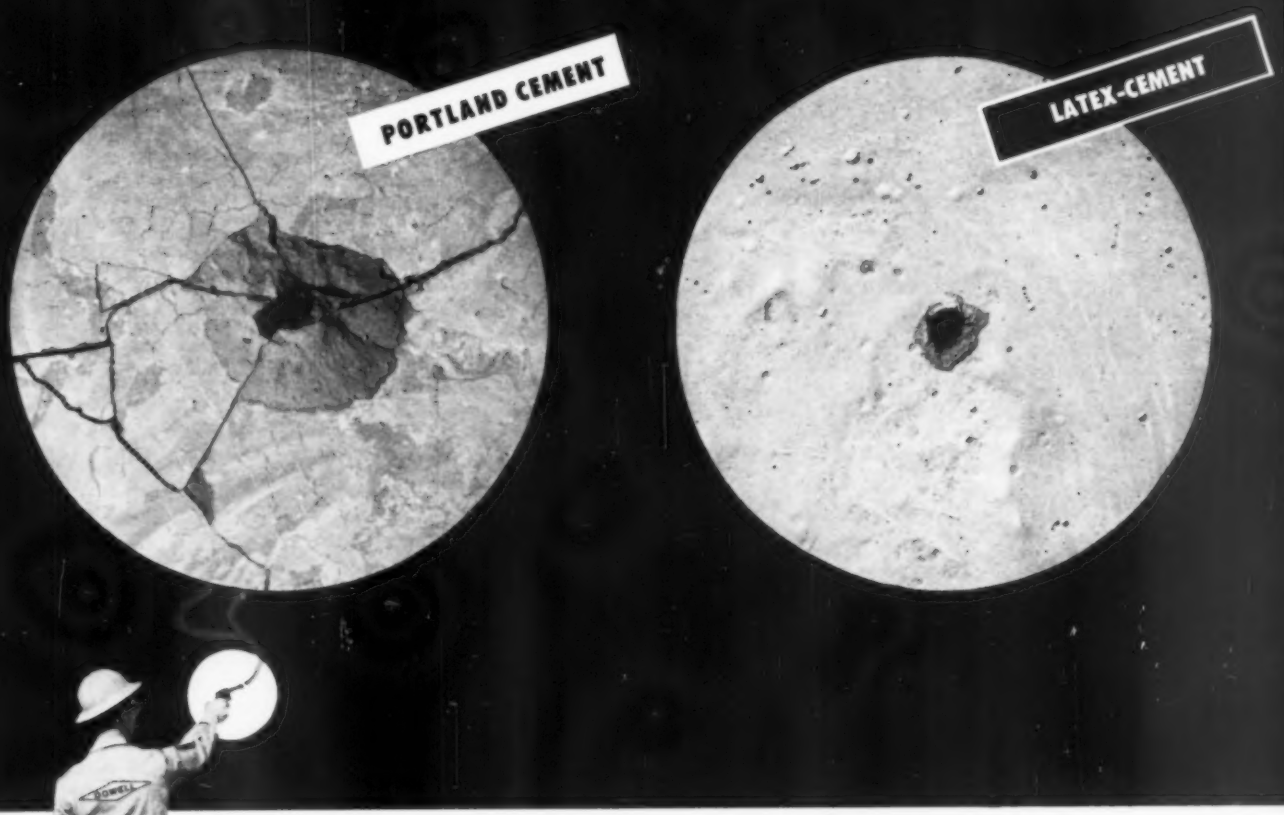
cost less than $18 per thousand feet of hole!

Keep your valve costs down—specify Mission Mud Monarch!

MISSION MANUFACTURING CO. • P. O. Box 4209 • Houston, Texas • Cable Address—"Missco" • Export Office: 30 Rockefeller Plaza, New York
In The United Kingdom: MISSION MANUFACTURING CO., LTD. • 17 Hanover Square • London, W. I. England • Cable Address—"Missoman"

SLUSH PUMP VALVES • PISTONS • VALVE SEAT PULLERS • LINERS • PISTON RODS • VALVE SPRINGS • GLAND PACKINGS • • SLIPS • SWABS • PLUG VALVES • CENTRIFUGAL PUMPS

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Shoreline Drlg Co Inc	Bge 6	dsl-elec	1700	Natl 23-9	1700	16,000
Southeastern Drlg Corp	20-Bge 6	dsl	1200	Oilwell 96	1100	16,000
Zapata Off-Shore Co	2	dsl	1850	Oilwell 96	1850	16,000
Plaquemines (Offshore) Parish						
Crown Rigs Inc	Bge 2	dsl	1000	Beth MC-450	1000	11,500
Kerr-McGee Oil Ind Inc	39	dsl	1880	Natl 125	—	16,000
	43	dsl	1730	Emsco 1000	1000	14,000
	45	dsl	1100	Oilwell 96	—	16,000
	48	dsl-elec	2495	Emsco EDA	—	16,000
Loffland Bros Co	1	dsl	1850	—	1500	18,000
	46	dsl-elec	1550	—	2840	20,000
	148	dsl	2521	—	2000	20,000
Ocean Drlg & Expl Co	St Louis	dsl-elec	1000	Emsco ECA	1200	15,000
Rowan Drlg Co Inc	MP 19	dsl-elec	2100	Unit U-1220-E	2250	20,000
Salt Dome Prod Co	Bge 3	dsl	750	Natl 110	—	12,500
Shoreline Drlg Co Inc	7	dsl	2400	Unit 1220	2400	20,000
Southeastern Drlg Corp	12-Bge 9	dsl	2250	Oilwell 96	1100	16,000
	22-Bge 8	dsl	1550	Natl	2200	18,000
Pointe Coupee Parish						
Crawford Drlg Co	1	dsl	695	Brwstr N-7	500	9,000
Glasscock-Wilson Inc	8	gas	1600	Natl 110	1200	15,000
	10	gas	1050	Natl 55	800	10,500
Richland Parish						
Big Chief Drlg Co	31	gas	1155	Emsco 800	1155	12,500
Montgomery Drlg Co	3	gas-btne	225	Crdwll S	—	5,000
St. Charles Parish						
Loffland Bros Co	39	stm	—	—	—	15,000
Penrod Drlg Co	11	gas	—	—	1425	12,000
Two R Drlg Co Inc	1	dsl	1050	Wlsn Titan	1425	15,000
St. James Parish						
B B M Drlg Co	7	stm	—	Emsco EC-54	—	18,000
St. Martin Parish						
Brewster-Bartle Drlg Co Inc	4	gas	—	Oilwell 76	—	11,000
Comet Drlg Co	1	stm	1200	Ideco Big Gnt	—	16,000
Delta Drlg Co	21	gas-btne	800	Natl 75	650	9,500
Doc Drlg Corp						
Blackie Drlg Co Inc						
Neva-Andre Drlg Corp	Bge DAN	dsl	1500	Beth 1013	1500	18,000
Harry L Edwards Drlg Co	8	stm	1000+	Natl 23-9-S	1000+	16,000
Falcon Seaboard Drlg Co	34	stm	1200	Natl 3410	—	25,000
Grey Wolf Drlg Co	3	stm	1050	Alco BIW 12	—	13,500
Howell Holloway & Howell	5	dsl	—	Unit U-15	—	9,500
Loffland Bros Co	143	dsl	1220	—	1200	15,000
St. Mary Parish						
Bilbo-Redding Drlg Co Inc	10	stm	900	Emsco UBLS54	1000+	12,500
Circle Drlg Co Inc	Bge 6	dsl-elec	2300	Ideco E2500	2750	20,000
Gilger Drlg Co	6	stm	1000+	Natl	1000+	15,000
C G Glasscock Drlg Co	4	dsl	1500	Natl 125	—	16,000,
Glasscock-Wilson Inc	7	gas	1200	Natl 80-B	800	12,500
Gracey-Hellums Corp	3	dsl	1775	Unit U-12-20	1800	20,000
Loffland Bros Co	93	stm	—	—	—	18,000
	144	dsl	1770	—	1510	18,000
Norton Drlg Co	Bge 3	stm	1200+	Natl 34-62	1500	17,000
The Power Rig Drlg Co	Bge 7	dsl	1200	Emsco GB-800	—	15,000
	8	gas-btne	1500	Ideco 7-11	—	15,000
Reading & Bates Offsh Drlg Co	1	dsl	3300	Natl 130	2200	20,000
Shoreline Drlg Co Inc	Bge 5	dsl	1240	Unit U-40	1200	12,500
C B Webster Drlg Co	8	stm	1600	Natl FE-34-10	1200+	15,000
Wheless Drlg Co	Bge 14	dsl	1300	Emsco J-1400	1400	16,000
St. Mary (Offshore) Parish						
Kerr-McGee Oil Ind Inc	40	dsl	1250	Emsco J-1600	1600	16,000
Loffland Bros Co	62	dsl-elec	1600	—	1500	20,000
	125	dsl-elec	1050	—	1600	20,000
Southeastern Drlg Corp	7	dsl	1500	Oilwell 96	1600	18,000
	23	dsl	1200	Oilwell 96	1600	18,000
	25	dsl	1500	Natl 130	1600	18,000
Tensas Parish						
J B Fletcher Drlg Co	3	dsl	—	Wlsn Giant	800	10,000
Jett Drlg Co Inc	1	dsl	—	—	700	9,000
	2	dsl	—	—	700	9,000
	6	gas-gaso	—	—	800	9,500
Pyburn Drlg Co	1	dsl	500	Ideco M-750	750	9,000
Terrebonne Parish						
An-Son Gulf Drlg Co	4	dsl	650	Natl 75	975	11,000
Brewster-Bartle Drlg Co Inc	5	dsl	—	Oilwell 96	1500	16,000
	7	dsl	—	Oilwell 96	1500	16,000
	8	dsl	—	Oilwell 96	1500	16,000
	11	dsl	—	Oilwell 96	1500	16,000
Continental Shelf Drlg Corp	Belle Claire	dsl	1700	Beth 1013	1950	18,000
Delta Drlg Co	11	stm	1000	Emsco UBLS54	1690	15,000
	19	stm	1200	Natl 34-10-FE	1690	15,000
Buster Gardner Drlg Co Inc	3	dsl	—	Beth 1013	—	17,500
C G Glasscock Drlg Co	6	dsl	1660	Natl 110	—	16,000
Loffland Bros Co	61	stm				18,000
Norton Drlg Co	Bge 2	stm	1200+	Natl 34-10	1500	17,000
Penrod Drlg Co	45	dsl			1500	20,000
	46	dsl-elec	1250	Emsco ECB	1250	20,000
The Power Rig Drlg Co	Bge 6	gas-btne	800	Emsco GB-500	—	11,000
Richardson & Stwt Drlg Co	Bge 1	pwr	—	Natl 130	1500	15,000
	4	stm	126	Natl Ideal 34	126	15,000
Terrebonne (Offshore) Parish						
Dixie Drlg Co Inc	4	dsl		Beth	—	17,500
Llano Drlg Co	6	dsl	2475	Oilwell 96	1800	20,000
Loffland Bros Co	145	dsl	1225	—	1560	14,000
Penrod Drlg Co	10	dsl			1500	18,000
Salt Dome Prod Co	10	dsl	1700	Beth 1013	—	15,000
	12	dsl	1350	Beth Tornado	—	14,000
Union Parish						
Cook Drlg Co	10	gas-btne	900	Wlsn Titan	975	12,500
H & S Drlg Co	2	gas-btne	1000	Brwstr N-95	1000	14,000
Jet Drlg Co Inc	5	gas-btne	750	Emsco 800	800	10,500
	6	gas-btne	1400	Brwstr N-95	1200	15,000
Vermilion Parish						
Bullard Drlg Co Inc	2	stm	1000+	Emsco ECB	1000+	16,000
Carter Beveridge Drlg Co	22	dsl	675	Beth MC-450	900	10,000
Clegg & Hunt	6	stm	—	Natl 9-DMB	—	14,000
Columbia Drlg Co	Bge 1	gas-gaso	300	TIW CT-5	—	7,500
Crawford Drlg Co	2	stm	—	Emsco ECA	500	15,000
Dixie Drlg Co Inc	1	dsl	—	Beth	—	17,500
Falcon Seaboard Drlg Co	29	stm	1200+	Natl 3410	—	25,000
Loffland Bros Co	60	stm	—	—	—	15,000
	73	dsl-elec	1030	—	1200	16,000
	82	stm	—	—	—	15,000
Mac Drlg Co	11	stm	800+	Natl 23-9 F-E	1000+	16,000
C B Webster Drlg Co	5	stm	1350	Natl FE-23-10½	1200+	15,000
Vermilion(Offshore) Parish						
Loffland Bros Co	37	gas	1050	—	1300	15,000
Webster Parish						
Arrow Drlg Co	5	gas	1250	Emsco	—	14,000
Cook Drlg Co	20	gas-btne	900	Wlsn Titan	975	12,500
	21	gas-btne	475	Wlsn Mogul	290	6,000
Penrod Drlg Co	15	stm	—	—	—	15,000
	35	stm	—	—	—	15,000
	40	gas-btne	—	—	580	7,000
Woolf & Magee Inc	1	stm	1000+	Natl 34	1200+	15,000
	8	gas-btne	1300	Beth Tornado	1300	15,000
	10	gas-btne	275	Beth Breeze	275	8,000-2¾"
MICHIGAN						
Branch County						
Gordon Drlg Co	1	gas-LPG	250	Oilwell 64	225	4,000
Clare County						
Gordon Drlg Co	12	dsl	600	Wlsn Giant	500	8,500
Union Rotary Corp	3	gas-LPG	200	Natl 40	180	4,000
Crawford County						
Fen-Par Expl Co Inc	2	dsl	100	Failing 1500	100	1,500
Gladwin County						
Gordon Drlg Co	7	gas-LPG	500	Oilwell 64-B	400	5,000
	10	gas-LPG	600	Oilwell 66	500	8,500
Isabella County						
Union Rotary Corp	6	dsl	475	Natl 50	575	7,500
Kent County						
Fen-Par Expl Co Inc	1	dsl	100	Failing 1500	100	1,500
Union Rotary Corp	5	dsl	475	Natl 50	575	7,500
Lapeer County						
Gordon Drlg Co	8	gas-LPG	600	Natl 50-A	500	7,500
Midland County						
Gordon Drlg Co	11	dsl	600	Wlsn Rodair	500	8,500
Missaukee County						
Union Rotary Corp	8	dsl	475	Natl 50	575	7,500
Montcalm County						
Union Rotary Corp	7	gas-LPG	220	Oilwell 64	220	6,000
Osceola County						
Gordon Drlg Co	3	gas-LPG	500	Oilwell 64-B	400	5,000
Roscommon County						
Union Rotary Corp	4	dsl	475	Natl 50	575	7,500
MISSISSIPPI						
Adams County						
B-M Drlg Co Inc	1	gas	440	Franks SAL 600D	440	7,000
Dorris Ballew Inc	5	dsl	380	Unit U-15	600	7,500
Fortenbery Drlg Co Inc	1	dsl	500	Ideco H-40	300	7,500



Here's one reason why CEALMENT has given better cement jobs

Most operators have had wells where perforating brought in unwanted gas and water in addition to desired oil production. Cement shattered by perforating shots could have been the cause. Costly squeeze jobs and re-perforating, with attendant rig time, are required to remedy the condition.

Cealment*, an exclusive Dowell service that utilizes latex-cement, helps you avoid many of the causes of faulty cement jobs. Latex-cement is more resilient than common Portland. That's why the man in the photograph could fire a 38-caliber revolver bullet through the latex-cement disk (right) without shattering it. The disk at left is common Portland cement after receiving the same treatment.

Laboratory tests and field experience indicate that the same thing may happen in your well. Cealment is especially useful for cementing a thin oil zone with gas or water nearby.

Resiliency is only one of many advantages of latex-cement. It bonds better, sets more dependably, and has shown excellent resistance to contamination by well fluids. More and more operators are finding that they are money ahead when they use Cealment.

For service, or for more information, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma.

*Service Mark of Dowell Incorporated

Services for the oil industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
	4	dsl	500	Ideco H-30	275	7,000
Jett Drlg Co Inc	5	dsl	—	—	600	7,500
Wilson Drlg Co Inc	1	dsl	212	Ideco H-35-D	424	8,500/3½"
Woolf & Magee Inc	11	gas-btne	275	Beth S-45	275	10,000/2⅛"
Clarke County						
Miller Drlg Co	1	gas	—	Hou Prtble	400	7,000
Sunnyland Contr Co Inc	7	dsl	—	Ideco H-40	450	8,000
	9	dsl	—	Crdwll D	450	8,000
Forrest County						
Dixilyn Drlg Corp	1	gas	900	Natl 75	650	12,000/3½"
Harrison County						
Larco Drlg Co	2	dsl	750	Oilwell 96	1200	14,000
Hinds County						
Larco Drlg Co	4	dsl	1000	Oilwell 96	1200	14,000
	5	gas	600	Oilwell 76	1000	10,000
Jefferson County						
Fortenbery Drlg Co Inc	5	dsl	500	Wisn Gnt	350	9,000
Sunnyland Contr Co Inc	12	dsl	1120	Ideco H-525 SC	1000	10,000
Jones County						
Gulf Coast Drlg & Expl Inc	4	dsl	800	Natl T-32	800	6,500
Lamar County						
Cock Drlg Co	18	gas-btne	670	Wisn Atlas	650	10,000
Drlg & Expl Co of Del Inc	37	gas-gaso	1200	Emsco GB-800	900	12,000
	39	gas-gaso	1200	Emsco J-1100	1050	15,000
	41	gas-gaso	1500	Emsco J-1100	1050	15,000
Lincoln County						
Dorris Ballew Inc	1	dsl	760	Wisn Titan	1300	12,500
Marion County						
Thompson Expl Drlg Co	2	gas-gaso	—	—	125	2,500/2⅛"
Pearl River County						
Crawford Drlg Co	3	stm	—	Oilwell 9	500	10,500
Larco Drlg Co	3	gas	400	Oilwell 64-B	750	8,000
Sunnyland Contr Co Inc	11	dsl	—	Ideco H-750	520	10,000
Simpson County						
Jett Drlg Co Inc	4	dsl	—	—	1100	13,000
Warren County						
Zach Brooks Drlg Co	8	dsl	1100	Brwstr N-95	1500	12,500
Yazoo County						
Cook Drlg Co	19	gas-btne	900	Wisn Titan	975	12,500
MONTANA						
Big Horn County						
R L Manning Co	10	gas-btne	1275	Emsco J-750	1125	11,000
True Drlg Co	10	gas-LPG	675	Unit U-15	675	8,500
Custer County						
Helmerich & Payne Inc	29	gas	700	Natl 75CA	1100	10,000
Daniels County						
Zach Brooks Drlg Co	5	dsl	900	Brwstr N-7	1182	8,500
Dawson County						
Willingdon Drlg & Expl Co Ltd	5	dsl	700	Unit U-20	1386	13,500
Fallon County						
Zach Brooks Drlg Co	4	dsl	1100	Brwstr N-75	1455	11,000
	6	dsl	1100	Brwstr N-75	1455	11,000
Helmerich & Payne Inc	15	dsl	700	Oilwell 76	1000	10,000
Hewit-Gulick Drlg Co	1	dsl	970	Natl 50-A	600	8,000
	2	dsl	970	Natl 80	900	12,000
R L Manning Co	8	dsl	550	Emsco G-500	550	7,500
	9	dsl	550	Natl 50	550	7,500
Roden & McRae Drlg Corp	4	dsl	1175	Emsco GB-800	900	12,500
Lewis & Clark County						
Mountain States Drlg Co Inc	14	dsl	800	Ideco M-1000	—	10,000
Musselshell County						
Hose-Austin Drlg Corp	1	dsl	350	Emsco GB-250T	450	6,000
	2	dsl	250	Emsco GB-160T	250	5,000/3½"
R L Manning Co	2	gas-btne	600	Emsco 300	300	5,500
	7	gas-btne	750	Emsco G-500	750	8,000
Pondera County						
Anschutz Drlg Co Inc	6	dsl	300	Wisn Giant	280	5,000
Prairie County						
Pioneer Drlg Co Inc	6	dsl	850	Emsco GB-800	1000	12,000
Roosevelt County						
Pioneer Drlg Co Inc	4	dsl	750	Emsco GB-500	600	9,000
J D Sprecher	4	dsl	600	Natl 80-B	800	10,000
Rosebud County						
Anschutz Drlg Co	12	gas	830	Brwstr N-45	530	6,500
Stillwater County						
George Noland Drlg Co Inc	7	gas-btne	—	Emsco PDM-36	440	5,000
	11	gas-btne	—	Unit U-15	730	8,500
Teton County						
M-H-O Drlg Co	8	gas-btne	800	Unit U-15	800	8,000
Treasure County						
Pioneer Drlg Co Inc	3	dsl	800	Emsco GA-500	700	9,000
Wibaux County						
Roden & McRae Drlg Corp	3	dsl	1175	Emsco GB-800	900	12,500
Yellowstone County						
Falcon Seaboard Drlg Co	9	gas-btne	325	Unit U-15	—	8,500
Tom Knight	1	gaso	250	Union Tool	—	5,000
Reliable Drlg Co	1	gas	350	Union Tool	350	5,000
NEBRASKA						
Banner County						
Ashby Drlg Co Ltd	1	dsl	300	Natl T-20	300	8,000/3½"
Garvey Drlg Co	16	dsl	300	Wisn Roadair	450	12,000/2½"
	19	dsl	300	Wisn Roadair	450	7,000/3½"
Miracle-Fifer Drlg Co	1	btne	300	Unit U-15	660	8,500
	2	btne	300	Unit U-15	660	8,500
Cherry County						
Ainsworth Inc	6	btne	100	Joy	100	3,000/2⅛"
Cheyenne County						
Don M Rounds Drlg Co Inc	1	dsl	350	Natl 50	350	6,000
Furnas County						
Falcon Seaboard Drlg Co	16	gas-btne	325	Unit U-15	—	8,500
Kimball County						
Exeter Drlg Co	1	dsl	325	Emsco GA-350	350	7,000
Don Johnston Drlg Co	3	gas-btne	650	Natl 50	650	7,500
	4	gas-btne	650	Natl 50	650	7,500
Lewis Bros Inc	1	dsl	376	Crdwll J-450	476	7,500
	2	dsl	376	Unit U-15	476	6,500
Don M Rounds Drlg Co Inc	2	dsl	500	Crdwll O	500	9,000
T C Strain Drlg Co	1	dsl	325	Unit U-15	500	7,000
Merrill County						
Ashby Drlg Co Ltd	2	dsl	300	Natl T-20	300	8,000/3½"
Herndon Drlg Co	2	gas	600	Natl 50-A	750	10,500
Richardson County						
Nemaha Oil Co	1	dsl	370	Frnks SAL 3000	370	4,500/3½"
NEVADA						
Churchill County						
Barry Well Drlg Co	2	dsl	200	—		3,000/3½"
Elko County						
Mountain States Drlg Co Inc	6	dsl	600	Natl 50	—	7,500
Eureka County						
Colorado Wyoming Drlg Co	1	dsl	300	Natl 50-A	600	9,000
NEW MEXICO						
Chaves County						
Makin Drlg Co	4	gas-gaso	975	Wisn Titan	1300	13,000
Moran Oil Prod & Drlg Corp	2	gas	—	Natl 75	750	8,500
Eddy County						
Donnell Drlg Co	12	btne	400	Beth S45E	—	5,000
Great Western Drlg Co	12	gas-gaso	—	—	1755	16,000
	18	dsl	—	—	1200	15,000
McDaniel & Beechert Drlg Co	6	gas-gaso	—	Hou Prtble		5,000
Rowan Drlg Co Inc	7	gas-btne	1260	Natl 100	1680	14,000
	9	gas-btne	900	Natl 75	1110	11,000
Southeastern Drlg Corp	3	dsl	1200	Oilwell 96	1600	18,000
S P Yates Drlg Co	2	dsl	350	Unit U-15	—	6,500
Lea County						
B B M Drlg Co	9	gas-btne	1300	Unit U-30	1800	18,000
Bolin Oil Co & D H Bolin	2	gas	225	Natl T-12	185	3,500
Cactus Drlg Corp of Tex	4	gas-btne	1050	Oilwell 76	1050	12,500
	5	gas-btne	700	Natl 75	700	10,000
	7	gas-btne	1275	Oilwell 96	1050	15,000
	10	gas-btne	700	Beth M-58	700	9,000
Carper Drlg Co Inc	4-R	gas-btne	675	Unit U-15	675	8,000
	5-R	gas-btne	650	Beth S-55	560	6,000
Coroco Drlg Co	1	gas-gaso	500	Beth 650	650	12,500
D-K Drlg Co	2	gas	675	Natl 50	675	7,500
Delta Drlg Co	9	gas-btne	936	Natl 100	800	12,000
Donnell Drlg Co	5	gas-btne	650	Unit U-15	650	8,000
	6	gas-btne	975	Beth MC-450	975	10,000
Durham Drlg Co Inc	3	gas	1150	Unit U-20	1300	14,000
Frank Frawley Drlg Co	2	gas	—	Unit U-20	—	13,000
	3	gas	—	Natl 100	—	13,000
Helmerich & Payne Inc	41	gas	1200	Natl 110	1500	13,500
	43	gas	700	Oilwell 76	700	10,000

When you make your derrick man reach out and wrestle the elevator with every stand of pipe, you are wasting drilling time and money . . . and sacrificing safety.

If you don't have a Hook Positioner you're sacrificing Time, Money and Safety!

Here's where Byron Jackson's *exclusive* hook feature pays off. The BJ Hook Positioner automatically rotates the elevator into the correct position for the derrick man. Elevator handles and door are ready for instant, easy latch-on. There's no groping, grabbing and griping.

The BJ positioner consists of a cam follower which travels on a hardened cam track. The cam follower may be set and locked in any of 24 regular positions. Whenever the load is released from the hook, the cam follower travels upward until it contacts the cam surface on the housing. It then automatically travels on the cam surface and rotates the hook body to the predetermined position. This accurately locates the elevator door handles so that the derrick man can quickly, easily and safely latch-on the next stand.

Don't make a monkey out of your derrick man. Make your next hook a BJ Hook with *exclusive hook positioner*. You'll save money . . . with safety!

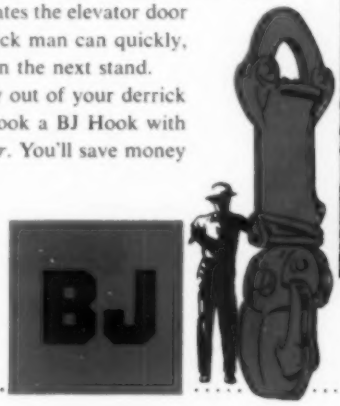
Here's How It Works!

Elevator at monkey board has door handles perfectly positioned for derrick man to load stand.

Going in hole, conditions such as crooked hole, bridges, etc. rotate hook body and elevator.

At rig floor, slips take load and BJ Positioner automatically rotates hook body to pre-set position.

Elevator is fully re-positioned into correct working position—for elevator opening at floor and for instant latch-on at board.



Watch BJ Red for the Newest

Byron Jackson Tools, Inc.

A Subsidiary of Borg-Warner Corporation

P. O. Box 2017A Terminal Annex, Los Angeles 54, California

Export Address:
580 Fifth Avenue, Suite 510
New York 36, New York

Offices in Houston, Fort Worth, Denver and New York

FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
	44	gas	1200	Oilwell 96	1500	15,000
La Mance Drlg Co	1	btne	350	Frnks 5000	—	5,000
	3	btne	550	Oilwell 64	—	6,500
	5	btne	550	Unit U-15	550	7,500
Laughlin-Porter Drlg Co Inc	6	gas	1000	Wisn Titan	—	14,000
Leatherwood Drlg Co	3	dsl	220	Natl T-20	—	6,000
Llano Drlg Co	1	dsl	1175	Oilwell 96	1200	15,000
Loffland Bros Co	20	gas	1000		1600	20,000
	99	gas	870	—	960	11,000
Lowe Drlg Co	2	gas	750	Natl 75	—	10,000
	3	gas	1000	Natl 100	—	12,500
	4	gas	1000	Natl 125	—	12,500
	5	gas	750	Natl 75	—	10,000
	7	gas	750	Wilson	—	10,000
	9	gas	2000	Natl 125	—	17,000
	10	gas	1000	Wilson	—	12,500
	11	gas	1250	Natl 100	—	12,500
Makin Drlg Co	7	gas-gaso	975	Wisn Titan	1300	12,500
	9	gas-gaso	450	Wisn Giant	400	5,000
	10	gas-gaso	650	Wisn Giant	600	8,000
B L McFarland Inc	5	gas	700	Brwstr N-75	—	12,000
	6	gas	1000	Brwstr N-95	—	14,000
McQueen & Stout Drlg Co	15	LPG	225	Crdwll RL	185	4,500
Moran Oil Prod & Drlg Corp	3	gas	—	Unit U-15	900	10,000
	4	gas	—	Unit U-34	300	4,500
Nichols Drlg Co Inc	6	gas-btne	1050	Wisn Titan	1050	15,000
	77	gas-btne	1530	Natl 110	1530	15,000
R Olsen	4	gas	1101	Wisn Titan	1101	12,500
R & H Olsen Drlg Co	1	gas	660	Wisn Giant	660	9,000/3½"
	2	gas	470	Wisn Giant	290	5,000
	3	gas	585	Hou Prtble	300	5,000
O'Neal Drlg Co	—	gas-gaso	—	Beth S-45-E	200	5,500
Parker Drlg Co	28	gas	—	Natl L-50	700	9,000
	33	gas	—	Natl 75	1000	11,000
	41	gas	—	Natl L-100	1400	14,000
	43	gas	—	Oilwell 96	1400	15,000
	45	gas	—	Natl L-125	1400	15,000
	49	gas	—	Natl L-125	1400	15,000
	54	gas	—	Natl L-125	1400	20,000
	55	gas-elec	—	Natl L-130	2000	20,000
Rowan Drlg Co Inc	29	gas-btne	1200	Natl 100	1480	14,000
	31	gas-btne	900	Natl 75	1149	11,000
Schoenfeld-Hunter-Kitch Drlg Co I		LPG-gas	—	Beth 650	1000	14,000
Sharp Drlg Co	18	gas	1050	Beth MC-950	—	15,000
	20	gas	1350	Beth MC-950	1350	15,000
	34	gas	1050	Beth 1013	1200	16,000
A W Thompson Inc	2	gas	650	Beth 10-13	1500	14,000
	3	gas	650	Emsco 800	1050	11,000
	4	gas	650	Beth 810	1050	12,500
	5	gas	650	Beth 810	1050	12,500
	6	gas	600	Beth 450	1050	11,000
	7	gas	650	Beth 450	1050	11,000
	9	gas	650	Clark Pr 1000	1050	12,500
	11	gas	650	Beth 450	1050	11,000
Urice Drlg Co	1	gas-btne	640	Emsco GA-500	640	8,500
Western Serv Drlg Co Inc	1	gas-btne	340	Natl 50	360	5,000
	10	gas-btne	1300	Beth 1013	1350	15,000
	11	gas-btne	1000	Beth 810	1100	11,000
S P Yates Drlg Co	1	dsl	350	Wisn 42 Torcair	—	5,000
McKinley County						
Empire States Drlg Corp	3	gas	225	Crdwll L	225	4,000
Kerr-McGee Oil Ind Inc	1	gas	825	Unit U-15	832	10,000
Thompson Expl Drlg Co	11	dsl	—	—	290	6,000/2⅞"
Rio Arriba County						
Arapahoe Drlg Co	1	gas-btne	300	Natl T-32	320	6,000
	4	gas-btne	375	Natl 50-A	680	8,000
Empire States Drlg Corp	1	gas	225	Unit U-34 Trlr	225	5,000
	2	dsl	450	Ideco H-35	450	6,500
Fleeger-Riley Drlg Co Inc	5	gas	360	Frnks 5000	500	5,000
Great Western Drlg Co	32	dsl	—	—	750	7,500
Moran Bros Inc	8	gas	700	Wisn Giant	750	10,000
Nichols Drlg Inc	3	gas-btne	700	Natl 50-A	700	9,000
Roosevelt County						
Carl B King Drlg Co of Tex	12	gas-gaso	1000	Natl 75	1000	12,500
Sandoval County						
Loffland Bros Co	91	gas	600	—	640	8,000
San Juan County						
Durham Drlg Co Inc	1	gas	500	Unit U-15	660	8,500
Fleeger-Riley Drlg Co Inc	4	gas	320	Unit U-15	600	8,000
	6	gas	450	Unit U-15	600	8,000
Foree Drlg Co	1	gas-btne	325	Unit U-34	300	4,500
Gardner Bros Drlg Co Inc	9	gas-btne	450	Unit U-15	675	7,000
	17	gas-btne	550	Natl 50-A	700	8,500
	19	gas-btne	185	Crdwell R	200	3,300
Great Western Drlg Co	19	dsl	—	—	600	5,500
	23	dsl	—	—	800	7,500
Miracle-Fifer Drlg Co	3	btne	300	Unit U-34	420	6,000
Moran Bros Inc	3	gas	700	Emsco GB-350	750	8,500
George W Riley Inc	4	gas-gaso	750	Crdwll O	—	10,000
	20	gas-gaso	200	Crdwll S	—	4,500
	21	gas-gaso	300	Crdwll Trlr	—	5,500
	22	gas-gaso	300	Crdwll Trlr	—	5,500
	41	btne	750	Unit U-15	660	10,000
Paul F Rutledge	5	gas	450	Natl 50	—	7,000
NEW YORK						
Onondago County						
Gordon Drlg Co	13	dsl	300	Crdwll S	300	4,500
NORTH DAKOTA						
Billings County						
J D Sprecher	2	dsl	600	Emsco J-750	750	9,500
Bottineau County						
Cardinal Drlg Co (Bismark)	1	dsl	320	Emsco GB-250	320	5,500
	2	dsl	320	Natl T-20	320	5,000
	—	dsl	280	Frnks	280	3,000
Burke County						
Calvert Drlg Co	23	dsl	350	Ideco H-526	600	8,500
Burleigh County						
Anschutz Drlg Co Inc	3	dsl	300	Wisn Giant	280	5,000
Divide County						
Rowan Drlg Co Inc	5	gas-btne	840	Natl 75	1120	11,000
Logan County						
Calvert Drlg Inc	22	gas-btne	320	Ideco H-35	330	5,500
McHenry County						
Anschutz Drlg Co Inc	5	dsl	300	Wisn Giant	280	5,000
McKenzie County						
Anschutz Drlg Co Inc	14	gas	900	Brwstr N-7	600	8,500
Helmerich & Payne Inc	33	gas	850	Oilwell 76	1100	10,000
Loffland Bros Co	124	gas	870		960	11,000
Penrod Drlg Co	31	dsl	—	—	1200	10,000
Rowan Drlg Co Inc	23	gas-btne	1140	Natl 75	1503	11,000
Paul F Rutledge	1	gas	450	Beth M-450	—	12,000
	2	gas	450	Beth M-58	—	10,500
	3	gas	450	Beth M-450	—	12,000
Mountrail County						
Calvert Drlg Co	24	gas-btne	600	Unit U-15	600	9,000
Loffland Bros Co	16	gas	970	—	1260	14,000
Williams County						
Exploration Drlg Co	9	gas	310	Beth S-50	200	5,500
Helmerich & Payne Inc	8	gas	600	Natl 55	800	7,500
Penrod Drlg Co	19	dsl	—	—	730	9,000
Rowan Drlg Co Inc	15	gas-btne	1140	Natl 75	1503	11,000
OKLAHOMA						
Alaka County						
Wolfe Drlg Co	5	gas-btne	735	Natl 50	735	7,500
Beaver County						
Arrow Drlg Co	11	dsl	595	Emsco 500	—	8,000
Baker & Taylor Drlg Co	2	dsl	650	Unit U-15	—	8,000
Beard Drlg Co	1	gas-gaso-btne	450	Emsco G-450	450	7,000
	2	gas-gaso-btne	500	Emsco GB-500	500	8,000
Falcon Seaboard Drlg Co	20	gas-btne	320	Unit U-15	—	8,500
Helmerich & Payne Inc	26	gas	500	Emsco GB-500	700	7,500
	36	gas	500	Emsco GB-50052	700	7,500
Midwestern Drillers Inc	2	dsl	320	Unit U-15	600	7,500
	4	gas	500	Emsco 500	650	8,000
Moran Bros Inc	2	gas	700	Emsco GA-500	750	10,000
	6	gas	700	Wisn Giant	750	10,000
Schafer Drlg Co	1	gas-gaso	1200	Unit U-40	900	12,000
	3	gas-gaso	400	Unit U-15	600	10,000
Service Drlg Co	3	LPG	650	Unit U-15	—	8,500
Unit Drlg Co	2	gas-btne	900	Unit U-15	900	8,500
Vierson & Cochran	5	gas	500	Natl 50	—	9,000
Webster Drlg Co	4	gas	650	Emsco 500	650	8,500
	6	gas	600	Beth	600	7,500
Beckham County						
Beckman Inc	17(wo)	gas	150	MIW P-42	175	10,000/2⅛"
Blaine County						
Perkins Bros Drlg Co	2	gas-btne	—	Unit U-15	675	8,500
Bryan County						
Exploration Drlg Co	11	gas	380	Beth S-60	480	8,000

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Draworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Caddo County						
Arrow Drlg Co	1	gas	860	Ideco 1000	—	11,500
	25	gas	840	Ideco 1000	—	10,000
Big Chief Drlg Co	2	gas	1875	Natl 100	1875	15,000
C N P Drlg Co	1	gas	185	Wichtex	145	3,500
Folk Drlg Co	1	dsl	200	Crdwll RL	200	4,000
G H Ray Well Serv	1	prop-gas	200	Wilson	200	4,500
Schafer Drlg Co	5	gas-gaso	1000	Unit U-40	1000	14,000
Viersen & Cochran	2	gas	500	Natl 55	—	10,500
Carter County						
Barrett Petroleum Co	1	gas-gaso	—	Natl 50	450	6,800
Big Chief Drlg Co	24	gas	750	Unit U-15	—	9,500
R A Davenport Drlg Contr	1	gas-btne	225	Natl T-12	185	3,500
Flournoy-Haston Drlg Co Inc	1	gas	275	Unit U-34	200	4,500
Goldsmith Drlg Co	1	—	400	Unit U-15	—	8,000
Graves Drlg Co	1	dsl	300	Frnks 4000-A	300	3,500
Ward S Merrick	1	gas	300	Wlsn Giant	—	5,000
Nichols Drlg Co Inc	1	gas-btne	350	Wlsn Giant	350	5,500
Perkins Bros Drlg Co	3	gas-btne	—	Beth S-60	370	7,500
Sherin Drlg Co	2	gas-gaso	500	Unit U-15	600	8,000
	3	gas-gaso	500	Unit U-15	600	8,000
Dick Wegener Drlg Contr	2	gas	500	Unit U-15	500	8,500
Cimarron County						
Moran Bros Inc	16	gas	650	Unit U-15	700	7,500
Cleveland County						
An-Son Drlg Co	1	gas	680	Beth MC 450	850	10,000
Bryant-Haywzrd Drlg Co	1	gas	675	Natl 50	500	8,500
	2	gas	675	Natl 50	500	8,500
	3	gas	700	Unit U-15	600	9,500
Calvert Drlg Inc	18	gas-btne	350	Unit U-15	600	8,500
N V Duncan Drlg Co	2	gas	600	Oilwell 64-A	600	9,000
	4	gas	600	Natl 50-A	600	9,000
Fleeger-Riley Drlg Co Inc	2	gas	320	Wlsn Giant	700	8,500
Garr-Woolley Co	3	gas-btne	320	Emsco 530-GB	—	9,500
Holliman Drlg Co	1	gas	500	Unit U-15	900	7,500
	2	gas	350	Unit U-15	550	7,500
Dave Morgan Drlg Co	—	LPG-gas	1050	Natl 83-B	800	10,000
Nichols Drlg Co Inc	8	gas-btne	650	Natl 50-A	650	9,000
	9	gas-btne	700	Natl 50-A	700	10,000
Nuckolls-Bell Drlg Co	3	dsl	600	Ideco H-525	704	9,000
O'Rourke-McGirl Drlg Corp	2	gas-btne	—	Unit U-15	800	8,000
Sherin Drlg Co	5	gas-gaso	500	Natl 55	750	9,000
Coal County						
Glendale Drlg Co	1	gas-gaso-btne	320	Unit U-10	330	5,000
Kerr-McGee Oil Ind Inc	41	gas	870	Natl 75	832	11,500
Riceland Corp	4	gas	1200	Brwstr N-95	—	16,000
Comanche County						
Blackstock & Bradley Drlg Co	3	dsl	290	Crdwll	—	4,000
J H & S Petroleum Corp	—	gas-gaso	—	Wichita 55	175	3,000
Creek County						
Blackstock & Bradley Drlg Co	2	gas	325	Crdwll	—	4,000
Curt Brown Drlg Co	1	dsl	320	Frnks Comet	320	5,000
Davon Drlg Co	4	gas-LPG	200	Brwstr N-2	290	6,500-2⅞"
Herring & Davis	2	gas-gaso	100	Mayhew 2000	100	2,000-2⅞"
	3	gas-gaso	150	Mayhew 2000	150	2,000-2⅞"
R L Horn & Sons Drlg Co	1	dsl	285	Frnks Comet	300	5,500
Sabre Drlg Co	4	gas-LPG	225	Brwstr N-3	160	3,500-4"
Gordon O Sams Drlg Co	2	gas-btne	185	Brwstr	185	3,000-3½"
Wade Drlg Co	1	dsl	145	Wlsn Mogul	185	3,500
Dewey County						
Viersen & Cochran	7	gas	970	Wlsn Titan	—	13,500
Garfield County						
Big Chief Drlg Co	27	gas	760	JS&G Spad Spr	760	9,500
Tommy Ward Drlg Co	3	gas	350	Unit U-35	650	8,000
Webster Drlg Co	5	gas	450	Natl 50	450	7,500
Wilcox Drlg Co	1	gaso	50	Failing 1500	—	1,500-2⅛"
	2	gaso	50	Failing 1500	—	1,500-2⅛"
Garvin County						
Beckman Inc	3(wo)	gas	150	MIW P-42	175	10,000
Big Chief Drlg Co	29	gas	1325	Emsco 1250	—	15,000
	30	gas	1320	Ideco 1050	1320	14,000
	33	gas	1250	Natl 55	1250	11,000
Big X Drlg Co Inc	1	gas-gaso	750	—	—	9,000
Falcon Seaboard Drlg Co	33	gas	1050	Beth 1013	—	16,000
Flournoy-Haston Drlg Co	2	gas-btne	330	Unit U-15	650	8,500
	3	gas	600	Wlsn Atlas	750	10,000
Goldsmith Drlg Co	2	—	400	Natl 50	—	8,000
Hap Drlg Co	3	gas	350	Emsco H-46	550	8,000
Helmerich & Payne Inc	24	gas	850	Natl 80	1100	10,000
	38	gas	850	Natl 80	1100	10,000
Jennings Drlg Co	5	btne-gas	450	Wlsn Giant	900	9,000
Kerr-McGee Oil Ind Inc	3	gas	870	Natl 75	832	11,500
Kingery Drlg Co Inc	3	dsl	210	Wilson	—	4,500
	10	btne-gas	300	Wilson	—	4,500
Loffland Bros Co	77	gas	970	—	960	11,000
Nichols Drlg Co Inc	4	gas-btne	450	Wlsn Giant	450	7,500
Parker Drlg Co	5	gas	—	Natl L-50	700	9,000
	56	gas	—	Natl L-50	700	9,000
	57	gas	—	Emsco 750	1000	10,000
Riceland Corp	3	gas	300	Brwstr N-75	—	10,000
Sherin Drlg Co	1	gas-gaso	500	Unit U-15	600	8,000
	4	gas-gaso	700	Natl 100	1050	12,000
Skipper Drlg Co	1	gas	325	Natl T-32	325	5,500
Viersen & Cochran	12	gas	325	Natl T-25	—	5,500
Chester H Westfall Drlg Co	1	gas-gaso	625	Unit U-15	700	10,400
Grady County						
Big Chief Drlg Co	32	gas	1650	Natl 110	1650	15,000
Falcon Seaboard Drlg Co	15	gas-btne	900	Unit U-20	—	16,000
Helmerich & Payne Inc	35	dsl	1100	Natl 110	1300	13,500
Parker Drlg Co	13	gas-elec	—	Natl L-34x10	1650	18,000
Riceland Corp	5	gas	800	Brwstr N-75	—	10,000
Viersen & Cochran	9	gas	980	Emsco J-1250	—	14,000
Kidd Williams Drlg Corp	10	gas	1050	Wlsn Titan	1200	18,000
Grant County						
Barrett Petroleum Co	5	gas-gaso	—	Brwstr N-7	750	8,500
Delaney Drlg Co	1	gas-btne	450	Unit U-15	450	7,500
Reed Drlg Co Inc	5	gas-gaso	275	Unit U-34	225	5,500
Tennant Drlg Co	1	btne	270	Frnks 6000	450	6,000
Viersen & Cochran	1	gas	325	Emsco G-300	—	5,800
	6	gas	255	Natl T-25	—	5,500
	14	gas	325	Natl T-25	—	5,500
Harper County						
Beckman Inc	19	—	180	Aico BIW P-42	175	4,000
T T Eason Co Div Eason Oil Co	15	gas	450	Emsco T-250	225	6,000
Falcon Seaboard Drlg Co	21	gas-btne	320	Unit U-15	—	8,500
Helmerich & Payne Inc	7	gas	500	Emsco GB-500-82	700	7,500
Keating Drlg Co	15	gas-gaso	—	—	675	9,000
Loffland Bros Co	146	gas	450	—	700	8,000
R W Rine Drlg Co	5	gas-btne	520	Brwstr N-55	550	7,500
Schafer Drlg Co	4	gas-gaso	200	Unit U-34	230	6,000
Webster Drlg Co	7	gas	700	Unit U-15	700	8,500
Hughes County						
Barrett Petroleum Co	3	dsl	—	Wlsn Giant	300	5,500
J & J Drlg Co	1	gas-btne	275	Beth S-45	450	4,500
Wolfe Drlg Co	12	gas-btne	342	Natl T-20	342	4,500
Johnston County						
Holliman Drlg Co	6	gas	750	Wlsn Atlas	950	10,000
Kay County						
Garvey Drlg Co	6	dsl	275	Unit U-15	640	8,500
Glenn Gillespie & Sons	7	dsl	300	Frnks 658 TRD	225	4,000
Dave Morgan Drlg Co	—	LPG-gas	350	Natl T-32	320	6,000
Le Flore County						
Viersen & Cochran	10	gas	325	Natl 50	—	8,800
Lincoln County						
Dudley & Heath Drlg Co	6	dsl	265	Crdwll S	320	5,500
Frizzell Drlg Co	1	gas-gaso	—	Wilson	600	7,500
Glenn Gillespie & Sons	3	dsl	425	Wlsn Mogul	280	6,000
Hap Drlg Co	2	gas	300	Brwstr N-4	200	5,000
Melco Drlg Co	2	btne	250	Brwstr N-35	250	5,000
Wm A Norton	1	gas-btne	300	Unit U-10	370	6,000
O'Rourke-McGirl Drlg Corp	1	gas-btne	—	Unit U-10	450	6,000
Sabre Drlg Co	3	dsl	285	Unit U-10	285	6,000-4"
Viersen & Cochran	13	gas	325	Natl T-16	—	5,200
Dick Wegener Drlg Contr	1	dsl	300	Frnks SAL	275	5,500
Logan County						
An-Son Drlg Co	2	gas	480	Unit U-15	540	7,500
Barrett Petroleum Co	4	dsl	—	Unit U-10	350	5,800
Big Chief Drlg Co	1	gas	450	JS&G Spad 'Super'	450	6,500
Catline Dodson Co Inc	1	gas-btne	450	Beth S-45	220	5,000
	2	gas-btne	675	Unit U-15	675	8,500
Meridian Drlg Co	1	gas-btne	—	Oilwell 64-B	450	8,500
Nuckolls-Bell Drlg Co	2	dsl	300	Ideco H-40	352	7,500
Reaves Drlg Co Inc	1	gas-btne	450	Emsco G-300	—	6,000
	4	gas-btne	630	Emsco GB 500-52	—	8,500
Love County						
Johnn Drlg Co	8	gas	500	Brwstr N-75	700	10,000
Kidd Williams Drlg Corp	5	gas	825	Wlsn Atlas	900	10,000
	6	gas	925	Wlsn Titan	1000	15,000
Marshall County						
T T Eason Co Div Eason Oil Co	14	gas	750	Emsco 6-B-500	750	9,000
Holliman Drlg Co	4	gas	225	Unit U-15	500	7,500

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Mc Clain County						
Arrow Drlg Co	18	gas	1260	Emsco 1250	—	14,000
Big X Drlg Co Inc	2	gas-gaso	750		—	10,000
Falcon Seaboard Drlg Co	28	gas	1200	Beth 650	—	16,000
Garr-Woolley Co	4	gas-btne	320	Emsco 500-GC	—	9,500
Hap Drlg Co	1	gas	350	Emsco GB-500	550	8,000
Helmerich & Payne Inc	40	gas	975	Oilwell 96	1100	13,000
Parker Drlg Co	34	gas	—	Natl L-75	800	10,000
	37	gas	—	Natl L-100	1400	14,000
	38	gas	—	Natl L-100	1000	14,000
Perkins Bros Drlg Co	4	gas-btne	—	Beth 650	1200	12,000
Viersen & Cochran	3	gas	600	Natl 75 CA	—	10,500
	4	gas	600	Natl 75	—	10,500
	8	gas	1200	Emsco J-1000	—	14,000
Murray County						
Kidd Williams Drlg Corp	11	gas	775	Wisn Atlas	1200	12,500
Muskogee County						
Trusco Drlg Co Inc	1	dsl	190	Frnks	190	3,500
Noble County						
An-Son Drlg Co	3	gas	400	Beth Breeze	250	4,500
Chambless-Rosen Drlg Co	1	gas	225	Crdwll	200	5,000
Davon Drlg Co	2	gas-LPG	280	Brwstr N-4	320	6,500
Target Drlg Corp	1	gas-btne	225	Unit U-34	195	5,000
Unit Drlg Co	1	gas-btne	290	Unit U-34	300	5,500
Nowata County						
Overby Drlg Co	3	btne	250	Mayhew 2000	250	2,000
Okfuskee County						
Doak Drlg Co	2	btne-gas	233	Natl T-20	250	4,500
Seran & Howard Drlg Co	1	gas	225	Beth	200	5,000
Oklahoma County						
Barrett Petroleum Co	2	gas-gaso	—	Natl 50	450	6,800
Calvert Drlg Inc	19	dsl	350	Unit U-15	600	8,500
Davon Drlg Co	1	gas-LPG	250	Brwstr N-4	300	6,000
	3	gas-LPG	500	Brwstr N-7	750	10,000
	5	gas-LPG	400	Brwstr N-45	320	7,500
Parker Drlg Co	30	gas	—	Natl L-50	700	9,000
Smiley & Little Drlg Co	4	gas	100	Wilson	100	2,600
Webster Drlg Co	3	gas	650	Wisn Atlas	650	10,000
Okmulgee County						
Smallwood & Son	1	gas-btne	145	Failing 1500	130	1,750
Osage County						
Curt Brown Drlg Co	2	dsl	320	Frnks Comet	320	5,000
Cyclone Drlg Co	2	LPG	—	Natl T-12	300	5,000
Doak Drlg Co	3	btne-gas	233	Natl T-20	250	4,500
Falcon Seaboard Drlg Co	19	gas-btne	185	Unit U-34	—	5,000
Garr-Woolley Co	1	gas-btne	185	Emsco 300	—	5,500
Glenn Gillespie & Sons	1	gas	360	Unit U-34	225	4,500
	6	gas	190	Unit U-34	225	4,500
John Heard & Co Inc	1	gas-LPG	240	Brwstr N-4	212	3,500
	2	gas-LPG	270	Natl T-12	212	3,500
Indian Drlg Co	1	btne	220	Ideco H-25	250	4,000
	2	dsl	220	Ideco H-35-S	350	5,000
Al Johnson Drlg Co	1	btne	325	Mayhew	200	3,500
	2	btne	325	Mayhew	200	3,500
Mesker Drlg Co	1	gas	200	Joy 300	200	2,500
	4	gas	200	Joy 300	200	2,500
The Novak Drlg Co	1	gas	225	Brwstr N-4	—	3,500
	3	gas	265	Brwstr N-45	—	5,000
Peak Drlg Co Inc	12	gas-LPG	220	Natl T-12	220	4,000
	14	gas-LPG	200	Brwstr N-35	200	4,000
Reed Drlg Co	3	gas-gaso	185	Wilson	145	2,800
	4	gas-gaso	300	Unit U-34	290	5,000
Gordon O Sams Drlg Co	1	gas-btne	175	Wisn Giant	250	6,000
Service Drlg Co	2	LPG	300	Unit U-34	—	4,500
	6	dsl	320	Brwstr N-4	—	4,500
	9	dsl	320	Natl	—	4,000
	10	LPG	250	Unit U-34	—	4,000
Pawnee County						
Bodard Drlg Co	1	gas	225	Unit	—	4,500
Glenn Gillespie & Sons	2	gas-dsl	360	Wisn Mogul	280	6,000
Pete Morris Drlg Co	1	dsl-gas	250	Wisn Giant	500	5,000
Wade Drlg Co	3	dsl	325	Crdwll L	225	4,500
Payne County						
Dudley & Heath Drlg Co	7	dsl	265	Brwstr N-4	320	5,500
Pete Morris Drlg Co	2	dsl-gas	450	Unit U-34	500	5,000
Reaves Drlg Co Inc	3	gas-btne	225	Emsco GB-60-T	185	4,500
Riceland Corp	1	gas	250	Ideco H-25	—	3,000
Sabre Drlg Co	2	dsl	260	Unit U-34	260	5,000-4"
Pontotoc County						
Don Clawson	1	gas-btne	240	Brwstr N-4	185	3,500
Jonco Drlg Co	1	gas-btne	350	Emsco 160	250	5,500

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Pottawatomie County						
Delaney Drlg Co	2	gas-btne	225	Unit U-34	225	5,000
The Novak Drlg Co	2	gas	300	Unit U-10	—	6,500
Reaves Drlg Co Inc	2	gas-btne	550	Emsco G-450		7,500
Pushmataha County						
Sikes Burckhalter	2	—	500	Wisn Atlas	750	10,000
Roger Mills County						
Webster Drlg Co	8	gas	1050	Ideco 7-11	1050	12,000
Rogers County						
Overby Drlg Co	1	btne-dsl	180	Mayhew 1000	—	1,000
Seminole County						
Austin Drlg Co	1	dsl	300	Unit U-34	300	5,500
Austin-Dunham Inc	1	gas-btne	350	Frnks SAL-6000	570	6,000
Johnson-Bates Drlg Co	1	gas	245	Unit U-34	300	4,500
	2	gas	300	Unit U-34	300	5,000
Jonco Drlg Co	2	gas-btne	300	Brwstr N-3	200	4,500
Melco Drlg Co	1	btne	250	Brwstr N-35	250	5,000
Poteet Wysor & Eckles Inc	1	gas-btne	225	Unit U-34	185	5,000
Reed Drlg Co Inc	1	gas-gaso	220	Unit U-34	235	5,000
	2	gas-gaso	—	Crdwll D	410	5,500
Troup & Suttles Inc	2	gas-gaso	200	Wilson	370	5,000
Stephens County						
Bryant-Hayward Drlg Co	4	gas	900	Brwstr N-75	700	12,000
Crowe Drlg Co	1	gas	175	Wisn Super 38	175	4,000
R V Dillard Drlg Co	1	gas	—	Wichtex	145	3,000
T T Eason Co Div Eason Oil Co	12	gas	1000	Natl 80-B	1000	12,000
Falcon Seaboard Drlg Co	32	gas-btne	1050	Beth 650	—	16,000
Flournoy-Haston Drlg Co	4	gas-btne	700	Natl 100	1000	14,000
Jackson Drlg Co	1	gas	600	Unit U-15	600	8,000
	3	gas	400	Wisn Mogul	400	5,500
Nichols Drlg Co Inc	2	gas-btne	700	Natl 55	700	12,000
	10	gas-btne	450	Wisn Giant	450	7,500
Star Drlg Co	1	gas	165	Wisn Super	165	2,500
Viersen & Cochran	11	gas	1525	Natl 110	—	18,500
Tommy Ward Drlg Co	2	gas	300	Beth 350	426	7,000
Dick Wegener Drlg Contr	3	gas	350	Wheland B-85	500	10,000
Chester H Westfall Drlg Co	2	gas-gaso	625	Unit U-15	700	10,400
	3	gas-gaso	625	Unit U-15	700	10,400
Texas County						
Arrow Drlg Co	20	gas	460	Emsco 350	—	7,000
Baker & Taylor Drlg Co	4-A	gas-btne	700	Emsco G-500	—	9,500
Garvey Drlg Co	1	dsl	500	Unit U-15	640	8,500
Tillman County						
Bolin Oil Co & D H Bolin	6	gas	350	Wisn Gnt Rdair	250	6,500
Tulsa County						
Riceland Corp	2	gaso	—	Failing 1500	—	1,600-2⅛"
Washington County						
Herring & Davis	4	gas-gaso	150	Joy 200-A	150	2,000-2⅛"
Washita County						
Reading & Bates Inc	2	gas-btne	1290	Natl 110	1650	15,000
Woodward County						
Reading & Bates Inc	6	gas-btne	590	Natl 75	800	9,000
	7	gas-btne	640	Natl 75	800	10,000
PENNSYLVANIA						
Berks County						
C S Garber & Sons Inc	—	gas-gaso	—	—	32	1,500
	—	gas-gaso	—	—	32	1,500
	25	dsl	—	Ingersoll	135	400
S W Jack Drlg Co	1	gas	—	Unit U-15	735	8,500
Bucks County						
C S Garber & Sons Inc	26	dsl	—	Ingersoll	135	130
	27	dsl	—	Ingersoll 4	—	250
Chester County						
C S Garber & Sons Inc	24	dsl	—	Ingersoll	135	130
Clearfield County						
Delta Drlg Co	24	dsl	670	Emsco GC-500	500	8,500
	29	dsl	750	Emsco J-750	750	12,000
S W Jack Drlg Co	2	gas	—	Unit U-15	600	8,500
Indiana County						
Delta Drlg Co	34	gas-btne	800	Unit U-15	600	8,000
Eakle & Holder Drlg Co	5	dsl	600	Natl 50	600	8,500
C J Simpson Drlg Co	1	gas-btne	—	Unit U-15	500	8,500
	2	gas-btne	—	Wisn Roadair	500	7,000
	3	dsl	—	Unit U-15	760	10,000
Jefferson County						
Fairman Drlg Co	1	gas-btne	500	Beth M-58	600	10,000
Montgomery County						
C S Garber & Sons Inc	—	gas-gaso	—	—	32	2,000
	23	dsl	—	Reich	—	1,200

HEWITT-ROBINS 5-FOR-1 HOSE PROGRAM

SAVES MONEY...ADDS MILEAGE TO ROTARY DRILLING HOSE

Through the Hewitt-Robins *5-for-1 Hose Program*, tool pushers and drilling contractors can save money and increase the mileage on Rotary Drilling Hose. This unique service consists of three easy steps. Here's how it works—

STEP 1 . . . . Purchase a standard 55-foot length of Hewitt-Robins Rotary Drilling Hose fitted with Stratoline Couplings.

STEP 2 . . . . After normal wear occurs, or if the hose is damaged in service, send the used hose to our factory repair service in Houston. If more than a 45-foot length of undamaged hose remains, we will reset the couplings, test to the original recommended pressure and return the shortened length for your use in drilling additional feet of hole.

STEP 3 . . . . When this shortened length wears out, additional salvage is possible. Once again return the hose to Hewitt-Robins for conversion into as many as three 12' to 15' lengths of vibrator hose.

Thus you actually can get 5 hoses for the purchase of one—with only a nominal charge for repair service. Anyway you figure it, this makes Hewitt-Robins Rotary Drilling Hose your most economical buy—*giving you more hose service for less hose dollars.*

For information about Hewitt-Robins Rotary Hose Repair Service, write, wire or call our District Office at 5711 Navigation Boulevard, Houston 11, Texas, WAlnut 6-3193.

HEWITT-ROBINS

STAMFORD, CONNECTICUT

INDUSTRIAL HOSE • CONVEYOR BELTING • CONVEYOR MACHINERY • VIBRATING CONVEYORS • VIBRATING SCREENS • DESIGN, MANUFACTURE, ENGINEERING AND ERECTION OF COMPLETE BULK MATERIALS HANDLING SYSTEMS • "JONES" POWER TRANSMISSION EQUIPMENT

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Potter County						
Delta Drlg Co	30	dsl	670	Emsco G-500	500	8,500
Westmoreland County						
Delta Drlg Co	10	dsl	560	Unit U-15	560	7,000
SOUTH DAKOTA						
Harding County						
Zach Brooks Drlg Co	3	dsl	750	Brwstr N-7	1455	8,500
Perkins County						
J D Sprecher	5	dsl	350	Brwstr N-45	350	6,500
TEXAS						
Anderson County						
Ace Drlg Co	2	gas	680	Emsco G-500	500	7,500
	3	gas	750	Natl 50-A	450	7,500
	4	gas	680	Emsco G-500	500	7,500
Harry Bass Drlg Co	109	stm	—	Emsco	—	14,000
B G Byars Power Drlg Co	3	dsl	445	Emsco G-300	300	5,500
Gibson Drlg Co	1	gas-btne	275	Wisn Mogul-42	265	5,000
Halbert Drlg Co	2	gas-btne	285	Wisn Roadair	445	6,500
Andrews County						
Arrow Drlg Co	17	gas	1260	Emsco 1250	—	14,000
	22	dsl	1200	Emsco 1000	—	14,000
	23	gas	840	Wilson	—	10,000
Harry Bass Drlg Co	112	gas	1200	Emsco	1200	12,000
L E Bever Drlg Co	1	gas	225	Unit U-34	225	5,500
Brantly Drlg Co Inc	3	gas	700	Brwstr N-75	750	11,000
	6	gas	400	Natl 50	750	9,000
Cactus Drlg Corp of Tex	3	gas-btne	1050	Natl 80-B	1050	12,500
Choya Drlg Co	1	gas	500	Emsco GB-500	550	8,500
Sam E Crump Drlg Co	2	gas	—	Unit U-15	730	9,500
Clark Dale Drlg Co Inc	1	gas	—	Oilwell 76	1000	12,500
Davidson Drlg Co Inc	A	gas-btne	1000	Emsco J-1250	1000	14,000
M J Delaney Co	27	gas-btne	500	Beth 450	650	11,000
Delta Drlg Co	6	gas-btne	800	Emsco J-750	750	9,500
The Denver Co	1	gas	335	Natl T-20	300	5,500
Donnell Drlg Co	9	gas-btne	1400	Beth MC-950	1400	15,000
Empire Drlg Co	5	gas	395	Unit U-15	570	8,000
	7	gas	650	Wins Titan	975	13,500
Frank Frawley Drlg Co	5	gas	—	Unit U-15	—	8,500
Lloyd R French Co	3	gas-btne	650	Natl 80	600	7,500
Great Western Drlg Co	27	gas-gaso	—	—	1125	15,000
Helmerich & Payne Inc	25	gas	1100	Oilwell 96	1100	13,000
Hewgley Drlg Co	3	dsl	—	Emsco J-750	975	10,000
Highland Drlg Co	2	gas	—	Emsco 450	500	5,600
Hissom Drlg Co	4	gas	400	Unit U-34	350	5,000
Johnn Drlg Co	4	gas	375	Unit U-15	600	8,500
Keating Drlg Co	8	gas-gaso	—	—	650	8,500
	18	gas-gaso	—	—	1150	14,000
Kerr-McGee Oil Ind Inc	14	gas	575	Wisn Giant	556	8,000
Carl B King Drlg of Tex	1	gas-gaso	1000	Natl 100	1000	13,500
	3	gas-gaso	1000	Natl 100	1000	13,500
	4	gas-gaso	1000	Natl 75	1000	12,500
	10	gas-gaso	1000	Natl 75	1000	12,500
King-Phillips Inc	1	gas-gaso	695	Natl 50	—	7,500
La Mance Drlg Co	4	btne	1050	Wisn Titan	—	13,000
Laughlin-Porter Drlg Co Inc	8	gas	800	Natl 75	—	12,000
Lee Drlg Co	4	gas-gaso	700	Natl 75	—	10,000
	5	gas-gaso	1050	Natl 100	—	13,000
	6	gas-gaso	1050	Oilwell 76	—	13,000
Llano Drlg Co	4	gas	—	Natl 75	700	12,000
Loffland Bros Co	64	gas	970	—	960	14,000
	67	gas	970	—	1050	14,000
Lowe Drlg Co	1	gas	500	Unit U-15	—	7,500
	6	gas	500	Unit U-15	—	7,500
Makin Drlg Co	1	gas-gaso	975	Wisn Titan	1300	13,000
Marcum Drlg Co	5	gas-btne	1000	Brwstr N-95	1525	14,000
B L McFarland Inc	8	gas	700	Brwstr N-75	—	12,000
	10	gas	500	Brwstr N-55	—	7,000
	12	gas	500	Brwstr N-55	—	8,000
McQueen & Stout Drlg Co	12	LPG	225	Crdwll RL	185	4,500
Milhoan Drlg Co	3	gas	900	Beth 450	—	10,000
L H & S A Olson Drlg Co	2	gas	490	Natl 50	500	8,000
	4	gas	450	Emsco G-350	500	7,000
	5	gas	240	Natl T-20	250	5,600/3½"
Parker Drlg Co	16	gas	—	Natl L-100	1400	14,000
	42	gas	—	Natl L-100	1400	14,000
	46	gas	—	Natl L-75	700	10,000
	47	gas	—	Natl L-100	1400	14,000
	51	gas	—	Natl 50	700	9,000
	52	gas	—	Oilwell 76	1400	12,500
Penrod Drlg Co	1	gas-btne	—	—	1800	15,000
Rheay & Reynolds Drlg Co	6	gas	300	Wisn Giant	750	5,000
Robinson Brothers Drlg Co	3	gas	300	Brwstr N-55	500	6,500
Schoenfeld-Hunter-Kitch Drlg	6	LPG-gas	—	Beth 650	1000	14,000
Sharp Drlg Co	36	gas	1350	Beth MC-950	—	15,000
	38	gas	700	Beth M-58	700	10,000
Southeastern Drlg Corp	1	gas	1200	Oilwell 96	1350	18,000
A W Thompson Inc	12	gas	350	Emsco 350	550	5,000
Thompson Expl Drlg Co	9	gas-gaso	—	—	100	1,500/2⅞"
Tri-Service Drlg Co	7	gas	370	Natl T-20	370	5,800
Warton Drlg Co	3	gas	970	Natl 110	1600	14,000
Aransas County						
Bilbo-Redding Drlg Co Inc	Bge 7	dsl	550	Oilwell 64-B	—	7,500
Archer County						
Akin & Dimock	2	dsl	300	Beth S-55	420	7,000
Ayers and Burch	3	btne	185	Wichtex	—	3,000
Bohn Oil Co & D H Bohn	3	gas	350	Wisn Giant	225	5,000
B M Hester	1	btne	325	Natl T-20	200	6,000
Louis Pitcock Drlg Co	2	gas-btne	225	Beth S-45	3250	4,000
R-G Drlg Co	1	gas-gaso	—	Wisn	650	6,500
Atascosa County						
Allen & Morris	2	stm	400	Alco BIW 11	1000	11,500/5"
Beard Drlg Inc	1	gas-btne	500	Wisn Giant	—	5,500
Buzzini Drlg Co	7	gas-btne	950	Wisn Atlas	930	11,000
Harkins & Co	7	dsl	600	Unit U-15	600	8,500
J E Hillier	1	dsl	400	Joy 300-A	200	4,000/3½"
Pegg Bros Drlg Co	1	gas-gaso	—	—	145	4,500/3½"
Austin County						
R & M Well Serv & Drlg Co	1	gas-btne	655	Unit U-15	380	8,000
Baylor County						
A D McDuffie	4	btne	165	Big Four	145	2,500
Bee County						
Appell Drlg Co	2	dsl	520	Frnks SG-101	400	7,000
The Oil Corp	5	gas-btne	280	Crdwll Trlrig	—	6,500
Rock Hill Drlg Co	1	dsl	475	Natl 50	500	8,500
Turnbull & Zoch Drlg Co	7	gas-btne	630	Ideco Rambler	630	10,000/3½"
Bexar County						
Armstrong & Horn Drlg Co	1	dsl	450	Brwstr N-4	—	7,000
Pegg Bros Drlg Co	2	gas-gaso	—	—	110	3,000/3½"
	3				90	1,500/2⅞"
Borden County						
Cactus Drlg Corp of Tex	6	gas-btne	675	Unit U-15	675	8,500
	9	gas-btne	925	Brwstr N-75	925	12,500
Donnell Drlg Co	10	gas-btne	650	Beth M-58	650	10,000
Hewgley Drlg Co	1	dsl	—	Emsco GA-500	650	8,500
J E Jones Drlg Co	1	gas	500	Oilwell 66	630	8,000
Marcum Drlg Co	1	gas-btne	325	Unit U-15	675	8,000
	2	gas-btne	500	Unit U-15	675	8,000
O'Neal Drlg Co	—	gas-gaso	—	Emsco GA-500	675	10,000
Tri-Service Drlg Co	2	gas	675	Oilwell 66	675	8,500
	5	gas	825	Oilwell 76	825	10,000
Brazoria County						
Bilbo-Redding Drlg Co Inc	4	gas-LPG	580	Wisn Giant	—	8,000
Harry T Bryant Drlg Co Ltd	4	gas-btne	900	Natl 75	900	12,000
Columbia Drlg Co	2	gas	500	Unit U-15	—	8,500
C J Foster Drlg Co Inc	2	gas-LPG	—	Brwstr N-75	834	11,000
	3A	stm	—	Alco BIW 12	1000+	18,000
Grey Wolf Drlg Co	4	gas-btne	585	Emsco GB-500	—	9,500
Hunt Drlg Co Inc	2	stm	750	Emsco UBLS	1000+	10,500
Kilroy Drlg Co	3	gas	450	Brwstr N-75	1200	12,000
Liberty Drlg Corp	3	gas-btne	1000	Natl 100	—	13,000
Loffland Bros Co	56	stm	—	—	—	15,000
Meadows & Walker Drlg Co	1	gas-btne	875	Oilwell 64	600	8,500
Caldwell County						
Travis Drlrs Inc	2	gas-btne	250	Brwstr N-3	165	3,000
Calhoun County						
Bay City Drlg Co Inc	3	gas-btne	560	Oilwell 66	560	9,000
Bilbo-Redding Drlg Co Inc	Bge 6	dsl	1050	Oilwell 76	—	12,500
C G Glasscock Drlg Co	7	gas	800	Unit U-15	—	9,000
	8	dsl	1200	Natl 75	—	12,000
Holmes Drlg Co	7	gas-gasu	—	Beth MC-450	1000	11,000
Miller Bros & Bowling	2	gas-btne	800	Emsco G-450	—	8,500
Rock Hill Drlg Co	3	gas-gaso	500	Unit U-15	600	9,000
Callihan County						
Gilchrist Drlg Co	1	btne	225	Wisn Mogul	145	4,000
Hack Drlg Co	4	btne	—	—	161	2,500
Paine Drlg Co	5	btne	350	Wisn Giant	450	7,000
Fred Pool Drlg Co	3	gas	225	Brwstr N-3	250	4,000
Sojourner Drlg Corp	5	btne	225	Natl T-8-S	—	3,500
Woodson Prod Co	1	gas	300	Mayhew 3000	200	4,000
Cameron County						
Fitzpatrick Drlg Co	3	dsl	775	Brwstr N-7	700	8,500

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Cutting and Burning Rotary Shoes
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Combination Stabilizer and String Reamers
Combination Jar and Key-Seat Reamers
Directional Drilling Bits and Pilot Reamers

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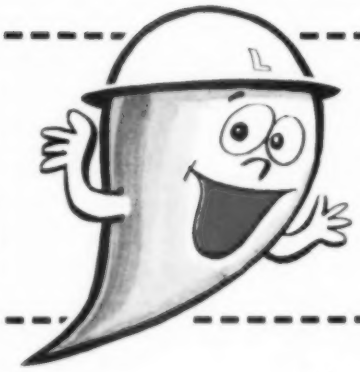
Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Carson County						
Keating Drlg Co	6	gas-gaso	—	—	450	5,000
Schafer Drlg Co	6	gas-gaso	200	Unit U-34	200	5,000
Cass County						
Butler-Johnson Inc	2	gas-btne	450	Brwstr N-55	450	8,000
	3	gas-btne	400	Brwdtr N-45	400	7,000
Carter-Jones Drlg Co	10	gas-btne	—	—	500	7,000
Delta Drlg Co	15	gas-btne	530	Unit U-15	600	8,000
Iran Drlg Corp	1	gas	300	Wlsn Giant	500	8,000
South States Drlg Co	2	dsl	275	Emsco GB-350	450	6,000
	4	dsl	275	Emsco GA-350	480	7,000/4"
Chambers County						
Bilbo-Redding Drlg Co Inc	5	gas-LPG	900	Beth 450	—	11,000
Comet Drlg Co	2	gas-btne	825	Natl 75	750	10,000
Henderson Drlg Corp	3	gas-btne	700	Natl 75	750	11,000
Kilroy Drlg Co	1	gas	600	Oilwell 96	1400	15,000
Mac Drlg Co	7	stm	500	Natl 34-26	5000	10,000
Rowan Drlg Co Inc	Bge 21	dsl-elec	1000	Emsco ECA	1920	12,000
Chet Whaley Well Serv Co	1	gas-gaso-btne	225	Wlsn Giant	225	5,500/3½"
Chambers (Offshore) County						
C G Glasscock Drlg Co	3	dsl	1500	Emsco J-1250	—	17,000
	5	dsl	1060	Natl 75	—	12,000
Cherokee County						
Butler Johnson Inc	4	gas	500	Brwstr N-4	350	6,500
Carter-Jones Drlg Co	12	gas-btne	—	—	720	9,000
J B Fletcher Drlg Co	2	dsl	—	Wlsn Giant	700	8,500
Maxwell Herring Drlg Corp	1	gas	300	Wlsn Mogul	400	6,000
Trant Drlg Co	3	stm	—	—		15,000
Childress County						
Del Mar Drlg Co	6	—	—	Wlsn Giant	—	10,000
McCutchen & Graham	3	btne	350	Wlsn Spr Gnt	650	9,000
Clay County						
Cooper Drlg Co	5	gas-btne	600	Wlsn Giant	600	7,500
R A Davenport Drlg Contr	2	gas-btne	145	Wichtex R-4	145	2,500
O E Hall Drlg Co	3	gas	320	Unit U-15	700	8,000
Jennings Drlg Co	6	btne-gas	350	Brwstr	350	6,000
Sikes-Burckhalter	1	—	500	Wlsn Giant	750	8,500
Jack L Story	5	gas-btne	450	Wlsn Giant	450	7,500
Cochran County						
Coroco Drlg Co	2	gas-gaso	650	Oilwell 96	900	15,000
Hissom Drlg Co	1	gas	600	Emsco 500	600	8,500
	2	gas	400	Unit U-34	500	6,000
M & J Inc	7	gas	269	Unit U-34	—	3,500
Makin Drlg Co	6	gas-gaso	650	Wlsn Giant	600	6,700
Western Drlg Co Inc	13	dsl	600	Crdwll 0	325	9,000
Coleman County						
Brannon & Murray Drlg Co	3	gas-LPG	250	Brwstr N-4	250	5,000
Camden Drlg Co	1	dsl	300	Natl T-20	300	5,000
Gore Drlg Co	3	gas	254	Joy 200A	—	2,500/2⅞"
Herb Expl Co	—	gas-gaso	—	Failing 1500	—	1,750/2⅛"
Maxwell Drlg Co	1	btne-gas	220	Brwstr N-4	220	5,500/3½"
Collin County						
Falcon Seaboard Drlg Co	24	gas-btne	1050	Beth 950	—	16,000
Colorado County						
Admiral Drlg Co Inc	E	stm	1000+	Ideco Jr Gnt	1000+	10,500
Appling Drlg Co Inc	2	stm	—	—	—	9,000
Bilbo-Redding Drlg Co Inc	3	stm	1050	Emsco UBLS54	1000+	12,500
	8	gas-LPG	1600	Natl 110	—	12,000
Buzzini Drlg Co	5	gas-btne	900	Wlsn Gnt	712	9,000
	8	gas-btne	1050	Wlsn Titan	1210	13,000
Columbia Drlg Co	5	dsl	400	Unit U-15	—	7,500
John Haseman Inc	1	gas-btne	350	Ideco H-35D	300	6,000
Holmes Drlg Co	1	gas-gaso	—	Beth ML-450	1000	11,000
	6	gas-gaso	—	Beth MC-450	700	10,000
Liberty Drlg Corp	1	gas-btne	750	Natl 75	—	10,000
Meredith & Co	3	gas-gaso-btne	—	Oilwell 96	1150	13,000
Rowan Drlg Co Inc	4	gas-btne	900	Natl 75	1149	11,000
Comanche County						
Herb Expl Co	—	gas-gaso	—	Failing 1500	—	1,500/2⅛"
Cooke County						
Alan Drlg Co	2	gas	350	Wlsn Mogul	185	4,000
Brown & Martin Drlg Co	1	btne	230	Wlsn Giant	215	5,500
	2	btne	150	Wilson	105	1,500
Felderhoff Bros Drlg Co	1	dsl	260	Wlsn Mogul	220	4,700
Roy Guffey Drlg Co	5	gas-btne	430	Unit U-34	260	5,500
Holliman Drlg Co	3	gas	255	Unit U-15	600	7,500
Gene McCutchin	5	gas	275	Wlsn Giant	275	6,500
Russell & Russell Drlg & Prod Co	1	gas-gaso-btne	275	Wlsn Giant	180	4,500
	2	—	—	Wlsn Mogul	—	—
	3	—	350	Wlsn Mogul	350	5,000
Taylor Expl Co Inc	6	gaso	—	Mayhew	—	1,000
Trachta Drlg Co	1	dsl	250	Wilson	185	3,000
Coryell County						
McCutchen & Graham	1	btne	425	Wlsn Spr Atlas	650	11,000
Crane County						
Blount Drlg Corp	3	gas-btne	275	Unit U-34	175	5,000
	4	dsl	275	Brwstr N-4	275	5,500
Clark Dale Drlg Co Inc	3	gas	—	Oilwell 66	660	10,000
Davidson Drlg Co Inc	B	btne	630	Wlsn Titan	900	10,000
Delta Drlg Co	36	gas-btne	900	Wlsn Titan	900	15,000
Durham Drlg Co Inc	2	gas	500	Unit U-15	675	9,000
Gardner Bros Drlg Co Inc	6	gas-btne	500	Natl 75	700	10,500
	8	gas-btne	500	Unit U-15	675	7,000
	12	gas-btne	750	Natl 100	1050	12,500
	18	gas-btne	400	Natl 50	575	7,000
Great Western Drlg Co	38	gas-gaso	—	—	675	7,500
	40	gas	—	—	840	10,000
Guadalupe Drlg Co	1	gas-btne	700	Ideco M 1000	—	10,000
Johnn Drlg Co	7	gas	185	Brwstr N-4	300	5,500
Keating Drlg Co	16	gas-gaso	—	—	450	6,500
Laughlin-Porter Drlg Co Inc	1	gas	800	Natl 50		7,000
	3	gas	416	Natl T-20		5,000
Lee Drlg Co	1	gas-gaso	700	Natl 50		8,000
	2	gas-gaso	700	Natl 50		8,000
Loffland Bros Co	140	gas	740	—	900	9,000
Marcum Drlg Co	4	gas-btne	325	Brwstr 55-W	450	6,000
McDaniel & Beecherl Drlg Co	10	gas-gaso	—	Oilwell 66	—	10,000
McQueen & Stout Drlg Co	11	LPG	225	Crdwll RL	185	4,500
O'Neal Drlg Co	—	gas-gaso	—	Emsco GB-500	700	11,000
Parker Drlg Co	39	gas	—	Natl L-100	1400	14,000
Rowan Drlg Co Inc	22	gas-btne	600	Natl 50	766	7,000
B B Smith Inc	1	gas	400	Brwstr N-4	300	6,000/3½"
	2	gas	450	Unit U-15	300	5,000
Goal Tullous & Co	2	gas	600	Emsco J-750	1050	10,000
Crockett County						
Bolin Oil Co & D H Bolin	1	gas	225	Natl T-12	145	3,500
Sam E Crump	1	gas	—	Unit U-15	650	8,500
Hewgley Drlg Co	6	dsl	—	Emsco GB-500	650	9,000
Carl B King Drlg Co of Tex	11	gas-gaso	900	Natl 75	900	11,000
L H & S A Olson Drlg Co	1	gas	490	Natl 50	500	8,000
Crosby County						
Cactus Drlg Corp of Tex	8	gas-btne	675	Brwstr N-7	675	9,000
Great Western Drlg Co	35	gas-gaso	—	—	630	7,500
Dawson County						
Harry Bass Drlg Co	101	gas	850	Emsco	570	9,000
Graham Drlrs Inc	1	—	300	Frnks 5000	330	5,000
Loffland Bros Co	142	gas	740	—	900	9,000
Marcum Drlg Co	6	gas-btne	900	Natl 75	1050	10,000
Milhoan Drlg Co	6	gas	600	Unit U-15	—	8,000
De Witt County						
Harkins & Co	4	gas-gaso	700	Wlsn Giant	700	9,500
Dimmit County						
Kirkwood & Morgan Inc	10	dsl-gas	400	Natl 40	200	6,000
Sutton Drlg Co	4	dsl	—	—	400	6,500
Duval County						
Falco Drlg Co	2	gas	600	Wlsn Giant	650	8,000
Field Drlg Co	3	dsl	1040	Emsco 500	520	8,500
	4	dsl	520	Beth Breeze	260	5,500
General Well Drlg Inc	3	gas-btne	400	Beth	—	5,000
A J Kuenstler Drlg Co	1	dsl	300	Wlsn Giant	300	7,500
The Oil Corp	3	gas-btne	280	Crdwll Trlrig	—	6,500
Rhodes & Hicks Drlg Corp	1	gas-btne	300	Frnks 137	—	5,500
Eastland County						
Irish Drlg Co Inc	2	btne	280	Wichtex R-3	—	3,000
	4	btne	360	Wichtex R-5	—	4,000
Red River Drlg Co	2	gas	165	Wichtex R-4	140	3,000
Ector County						
Arrow Drlg Co	24	dsl	1200	Emsco 1000	—	14,000
Brantly Drlg Co Inc	4	gas	375	Beth S-55	480	6,500
	5	gas	385	Emsco 250	250	4,000
Calvert Drlg Inc	Rep	dsl	260	Ideco H-30	190	5,000/4"
Curtis & Lomax Drlg Co	11	gas-btne	300	Unit U-15	675	8,500
Clark Dale Drlg Co Inc	2	gas	—	Natl 50	600	8,500
Davidson Drlg Co Inc	C	btne	660	Emsco GC-500	660	8,500
	D	btne	315	Wlsn Giant	600	7,500
M J Delaney Co	19	gas-btne	600	Emsco J-1250	1200	15,000
	30	gas-btne	500	Beth 1013	1200	15,000
Delta Drlg Co	2	gas-btne	400	Natl 50	450	7,000
Dixilyn Drlg Corp	3	gas	950	Natl 100	950	14,000
Eastland Oil Co	1	gas	—	—	750	10,000
	2	gas	—	—	540	7,500
	4	gas	—	—	190	4,500



Hi! since you are looking through this magazine, chances are you're going to drill a well...

...and

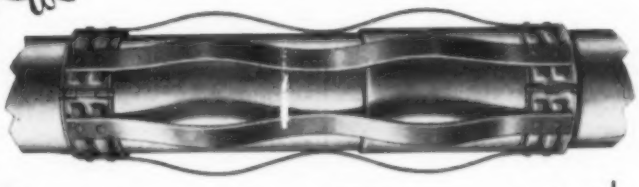
if you do, you are going to need dependable floating equipment...

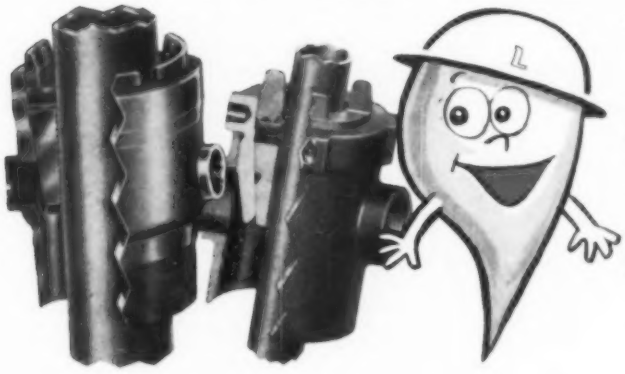
MAKE IT LARKIN.

...also

you'll need casing centralizers to help make sure of a good cement job.

MAKE IT LARKIN.





...and

if you are going to drill in an area of medium depths and pressure, you'll need a compact, dependable and economical casing head and tubing head.

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LARKIN PACKER COMPANY, INC.
WAXAHACHIE, TEXAS

LARKIN
...Through Your Supply Store

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LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Exploration Drlg Co	7	gas	1200	Natl 80-B	1350	13,000
	12	dsl	1200	Natl 125	1350	16,000
Gardner Bros Drlg Co Inc	5	gas-btne	500	Natl 75	675	9,000
	16	gas-btne	1000	Natl 125	1400	15,000
Helmerich & Payne Inc	42	gas	970	Natl 100	1000	12,000
Hewgley Drlg Co	4	dsl	—	Emsco GA-500	650	8,500
Baker B Ingram Inc	2	gas	300	Unit U-10	300	6,000
Keating Drlg Co	11	gas-gaso	—	—	650	8,500
Carl B King Drlg Co of Tex	5	gas-gaso	1000	Natl 100	1000	13,500
Laughlin-Porter Drlg Co Inc	7	gas	400	WlsnTorcair	—	5,000
Makin Drlg Co	2	gas-gaso	650	Wlsn Giant	600	8,000
Milhoan Drlg Co	7	gas	600	Oilwell 76	—	8,000
Parker Drlg Co	4	gas	—	Natl L-100	1400	14,000
	32	gas	—	Natl 50	700	9,000
	58	gas	—	Natl L-100	1400	14,000
Rowan Drlg Co Inc	16	gas-btne	504	Natl 50	660	7,000
Schoenfeld-Hunter-Kitch Drlg Co	7	LPG-gas	—	Natl 110	1200	16,000
Warton Drlg Co	2	gas	370	Natl 50	700	8,500
Western Drlg Co Inc	17	btne	440	Crdwll L	145	4,000
Fayette County						
Grey Wolf Drlg Co	2	dsl-elec	1250	Alco BIW 12	1250	15,000
Hamman Oil & Ref Co	6	dsl	250	Brwstr N-4	310	6,500
Fisher County						
Bolin Oil Co & D H Bolin	4	gas	350	Wlsn Gnt	500	7,500
Empire Drlg Co	8	gas	500	Unit U-15	650	8,500
General Geophysical Co	31	dsl	—	—	500	7,500
Gilchrist Drlg Co	6	btne	700	Natl 50	700	8,000
Hack Drlg Co	2	btne	—	Crdwll S	161	4,500
Johnson-Gadbois Drlg Co	1	gas	440	Wlsn Gnt	440	8,000
R-G Drlg Co	5	gas-gaso	—	Wlsn	650	8,000
Rhodes Drlg Co	5	gas	450	Unit U-15	675	9,000
A B See Drlg Co	2	gas	400	Wlsn Mogul Tre	250	5,000
Sojourner Drlg Corp	1	btne	218	Unit U-15	—	7,500
West Central Drlg Co	5	gaso-btne	325	Unit U-15	—	7,500
	7	gaso-btne	225	Wlsn Giant	—	5,000
Foard County						
Cooper Drlg Co	3	gas-btne	450	Natl 50	450	6,500
Fort Bend County						
Harry T Bryant Drlg Co Ltd	2	gas-btne	700	—	600	8,000
Hunt Drlg Co Inc	3	gas	525	Emsco GB-350	443	8,500
Franklin County						
Big Chief Drlg Co	5	gas	1320	Emsco 1250	1320	14,000
Gibson Drlg Co	3	gas-btne	300	Wlsn Giant	275	6,000
	5	gas-btne	275	Wlsn Giant	275	6,000
Freestone County						
Delta Drlg Co	22	gas-btne	530	Unit U-15	600	8,000
Frio County						
Appell Drlg Co	4	gas-gaso	315	Wlsn Mogul	175	4,000
Milam Drlg Co	1	gas	500	Emsco G-500	500	7,500
Sutton Drlg Co	3	dsl	—	—	350	6,500
Gaines County						
B B M Drlg Co	1	gas-btne	950	Emsco GB-800	1050	14,000/4"
	2	gas-btne	1100	Emsco GB-800	1050	14,000/4"
	6	gas-btne	400	Emsco GB-500	650	10,000/3½"
Brantly Drlg Co Inc	2	gas	975	Emsco 800	1000	14,000
	7	gas	675	Beth 450	1125	12,500
M J Delaney Co	26	stm	—	Natl T-38	—	15,000
Frank Frawley Drlg Co	4	gas	—	Unit U-40	—	10,000
Lloyd R French Co	2	gas-btne	675	Unit U-15	600	7,500
Great Western Drlg Co	2	gas-gaso	—	—	840	9,000
	17	gas-gaso	—	—	1260	15,000
O E Hall Drlg Co	5	gas	700	Unit U-40	1210	12,000
Keating Drlg Co	13	gas-gaso	—	—	1000	12,000
La Mance Drlg Co	2	btne	700	Unit U-15	—	9,500
Lumac Drlg Co	1	dsl	265	Crdwll R	145	4,500
B L McFarland Inc	11	gas	1000	Natl 100	—	13,000
Moran Oil Prod & Drlg Corp	1	gas	—	Unit U-15	900	10,000
Parker Drlg Co	53	gas	—	Natl 75	1000	11,000
Robinson Brothers Drlg Co	1	gas	800	Brwstr N-75	800	10,000
Rowan Drlg Co Inc	12	gas-btne	1260	Natl 100	1680	14,000
	26	gas-btne	1200	Natl 100	1480	14,000
Sharp Drlg Co	32	gas	900	Beth MC-450	—	12,000
Goal Tullous & Co	1	gas	500	Emsco J-750	1050	10,000
Galveston County						
Admiral Drlg Co Inc	G	dsl	650	Beth M-58	300	9,500
Penrod Drlg Co	8	gas-btne	—	—	1230	10,000
	17	dsl	—	—	1464	14,000
	18	stm	—	—	—	15,000
W L B Drlg Co	1	gas-gaso-btne	350	Brwstr N-35	165	3,500
Galveston (Offshore) County						
Kerr-McGee Oil Ind Inc	44	dsl	1760	Ideco 1350	—	20,000
Zapata Off-Shore Co	1	dsl	1850	Natl 130	1400	15,000
Garza County						
Calco Drlg Co	3	gas-btne	275	Emsco GB-250	250	5,500
	4	gas-btne	215	Beth Breeze	200	5,500
Coroco Drlg Co	6	gas-gaso	400	Oilwell 66	500	9,000
Slim Rea Drlg Co	2	dsl	275	Brwstr N-4	—	6,000
Smith & Breyer	3	btne-dsl	55	Spencer	—	4,250
Goliad County						
Rock Hill Drlg Co	2	dsl	475	Natl 50-A	450	8,500
Gray County						
Beckman Inc	12(wo)	gas	150	—	175	10,000/2⅞"
Cree Drlg Co Inc	7	gas-btne	185	Emsco 250	300	4,500
Drlg & Expl Co of Delaware Inc	25	gas	225	Frnks	400	5,000
Hills & Hills Drlg Co	1	gas-btne	500	Emsco GB-350	—	6,500
Moran Bros Inc	5	dsl	300	Wlsn Giant	350	5,000
Murphy & McKernan	1	dsl	390	Unit U-15	375	7,500
Schafer Drlg Co	7	gas-gaso	200	Ideco H-35	200	5,000
	9	gas-gaso	300	Ideco H-35	300	7,500
Tommy Ward Drlg Co	1	gas-btne	300	Unit U-15	426	7,000
Grayson County						
Berry Drlg Co	1	dsl	350	Wlsn Giant	500	6,500
M J Delaney Co	9	stm	—	Emsco 34-26	—	10,000
Holliman Drlg Co	5	dsl	825	Emsco GB-800	1000	11,000
Howell Holloway & Howell	2	dsl	—	Ideco	—	6,000
	4	dsl	—	Unit U-15	—	9,500
	6	dsl	—	Ideco H-30	—	7,000
Johnn Drlg Co	6	gas	850	Brwstr N-95	1300	14,000
Penrod Drlg Co	38	gas-btne	—	—	1170	10,000
Tibbits & Moore Drlg Co	1	gas	325	Natl T-32	350	6,500
	2	gas	350	Wlsn Giant	425	7,000
Gregg County						
Nowery Drlg Co Inc	1	dsl	1000	Ideco 1050	1000	12,000
South States Drlg Co	3	dsl	330	Emsco GB-350	520	8,000/4"
United Drlg Co (Texas)	1	gas-btne	225	Crdwll S	240	5,000
Guadalupe County						
Bay City Drlg Co Inc	2	gas-btne	300	Unit U-34	300	5,000
R V Muckelroy & Son	1	dsl	185	Beth S-50	200	4,000
Hansford County						
Arrow Drlg Co	10	gas	560	Emsco 500	—	8,000
Baker & Taylor Drlg Co	1	dsl	650	Unit U-15	—	8,000
	3	dsl	650	Unit U-15	—	8,000
Cree Drlg Co Inc	4	gas-btne	350	Emsco GA-500	600	9,000
Midwestern Drillers Inc	3	dsl	370	Unit U-15	600	7,500
Moran Bros Inc	1	gas	1050	Wlsn Titan	1150	14,000
Rowan Drlg Co Inc	10	gas-btne	1020	Beth 450	766	9,000
Rip C Underwood	1	gas-LPG	—	Unit U-15	660	9,500
Urice Drlg Co	5	gas-btne	500	Wlsn Giant	500	8,000
Hardin County						
CBS Workover Co	1	gas-btne	300	Ideco H-30D	215	4,500
Clegg & Hunt	1	stm	—	Emsco 10	—	15,000
	2	stm	—	Emsco H-54	—	11,000
C J Foster Drlg Co Inc	4	gas-LPG	—	Hou Prt	550	8,500
Lusk Drlg Co	14	gas	600	Crdwll Trlr	380	6500
Carnes W Weaver Drlg Co	1	gas-btne	700	Oilwell	—	10,500
Harris County						
Admiral Drlg Co Inc	A	gas-gaso-btne	250	Oilwell 64-A	300	7,000
	C	stm	1000+	Unit U-9	1000+	12,000
	F	gas-LPG	700	Wlsn Gnt	350	8,500
Bay City Drlg Co Inc	1	gas-btne	430	Oilwell 52-T	430	6,500
Bilbo-Redding Drlg Co Inc	1	dsl	550	Whind 65	—	9,500
Harry T Bryant Drlg Co Ltd	3	gas-btne	700	TIW 5	600	8,000
CBS Workover Co	3	gas-btne	300	Ideco H-30D	215	4,500
Columbia Drlg Co	Bge 4	gas	600	Emsco GC-500	—	10,000
Comet Drlg Co	3	stm	900	Ideco Jr Gnt	—	10,000
Edwards & Bissett Inc	6	gas-btne	600	Ideco H-40D	500	7,000
Foretich Drlg Co Inc	1	gas	745	Unit U-35	450	8,000
C J Foster Drlg Co Inc	8	gas-LPG	—	Wlsn Gnt	366	8,000
Hill Drlg Co	1	gas-btne	425	Unit U-35	370	8,000
Houston Oil Well Serv Co	4	gas-btne	—	Ideco M-10,000	855	10,000
Meadows & Walker Drlg Co	2	stm	500	Alco BIW 12	1000+	12,000
Miller Bros & Bowling	3	gas-btne	850	Emsco GC-500	—	9,000
Prince Marine Drlg & Expl Co	1	stm	1400	Alco BIW 12	1200+	13,000
Triton Drlg Co Inc	8	gas	800	Unit U-15	800	10,000/4"
Harrison County						
Maxwell Herring Drlg Corp	4	gas	500	Wlsn Gnt Rdair	400	8,000
Ruhl Drlg Co Inc	1	—	475	Brwstr N-7	625	8,500
Tex-Mex Drlg Co	10	gas	—	Emsco GB-500	—	9,000
Haskell County						
E W Moran Drlg Co	1	gas	500	Unit U-15	560	7,500
A B See Drlg Co Inc	1	gas	400	Natl T-20	250	5,000

Prevent Casing Failures

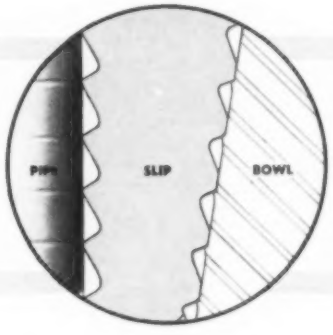
SPECIFY and USE

McEvoy "Controlled Friction" Casing Hangers

Your well investment is no safer than the Well Head Equipment and Casing Hangers which support your casing strings. Like good insurance in a safe, sound company, good Casing Hangers dependably protect your investment every minute of the day and night. They work for you without attention or care for years and years . . . for the entire life of your wells. Your wells deserve the best, most reliable, and in the long run, the cheapest . . . McEvoy's unique, exclusive and unrivaled "Controlled Friction" (CF) Casing Hangers. Easily recovered, completely salvageable.

The only Engineered Hangers with Capacity Curves available—write for details and data . . . then compare!

A set of McEvoy new revolutionary "CF" Slips, showing both inner (sharp) and outer (dull) teeth. You can see that these outer teeth are not merely "rough machined", but are actual precision-made teeth that controllably engage the slip-bowl.



Sectional view showing McEvoy "CF" Slips, with sharp teeth on one side securely supporting the casing, and dull teeth on other side which control the slip-bowl friction, and automatically limit the downward movement of the slips in their bowl.

Casing pressures, test pressures, or high pressure remedial work cannot load the slips or change their pipe load capacity. Hydraulic and mechanical loads are completely separated.

Available for all wells

FOR THE WORLD'S DEEPEST WELLS

McEvoy SB-2 Casing Hangers were developed through extensive research, and have proved the complete answer to every deep, high pressure, heavy string need. May be wrapped around the pipe and dropped through the preventers, automatically **set** and **seal,** providing the ultimate in safety. Will safely support **any casing string that can be picked up in the derrick.**

FOR MEDIUM DEPTH WELLS

McEvoy Type CB or CB-2 Casing Hangers were designed and are fully field proven for handling all medium and medium-heavy casing strings in complete safety to the full strength of short thread API couplings. They satisfy a long felt user need for simple, functional and dependable lower cost casing hanging equipment.

McEvoy "CF" Hangers have been proven and demonstrated . . . Let us show you.

McEvoy COMPANY

OIL WELL EQUIPMENT

TEXAS AND MILBY ST. • P. O. BOX 3127 HOUSTON 1, TEXAS

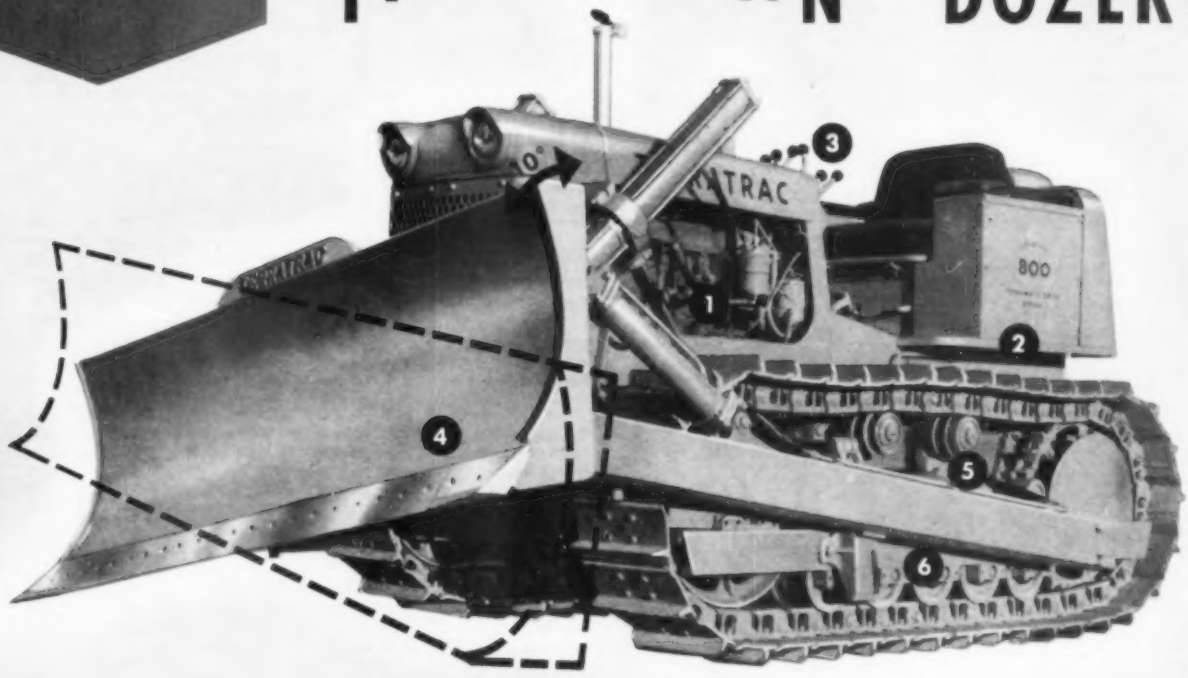
Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Avail- able to Drwwks	Rated Depth with 4½ " Pipe
Sojourner Drlg Corp	2	dsl	320	Unit U-15	—	5,000
Wes-Tex Drlg Co	1	btne	338	Unit U-10	326	7,500
Hemphill County						
Beckman Inc	2(wo)	gas	185	Beth S-50	185	3,500
Hidalgo County						
Clark Fuel Prod Co	2	dls	740	Wlsn Giant	520	8,500
Fitzpatrick Drlg Co	1	stm	800+	Ideco	1000+	12,000
	4	gas	1050	Beth 650	1000	13,000
Gilmour Drlg Co	1	gas	500	Wlsn Giant	300	6,000
Harkins & Co	1	gas-gaso	555	Unit U-15	555	8,500
Holmes Drlg Co	3	gas-gaso	—	Natl 110	1500	16,000
J & C Drlg Co	6	gas-btne	450	Natl 50	450	7,500
Richardson & Stewart Drlg Co	3	pwr	1000	Emsco GB-500	700	9,000
Hockley County						
M J Delaney Co	29	gas-btne	500	Beth 450	750	11,000
Graham Drlrs Inc	2	—	300	Frnks 5000	330	5,000
Great Western Drlg Co	16	gas-gaso	—	—	1260	15,000
	37	gas-gaso	—	—	1200	10,000
Loffland Bros Co	80	gas	1000	—	960	11,000
Makin Drlg Co	3	gas-gaso	975	Wlsn Titan	1300	13,000
Warton Drlg Co	4	gas	700	Emsco J-750	1000	12,000
Western Drlg Co Inc	18	btne	450	Crdwll O	225	8,000
Houston County						
B G Byars Power Drlg Co	2	gas-btne	1145	Emsco GA-500	750	10,500
United Drlg Co (Texas)	3	gas-btne	500	Unit U-10	400	7,500
Howard County						
Brantly Drlg Co Inc	1	gas	365	Emsco 500	500	9,000
Curtis & Lomax Drlg Co	1	gas-btne	300	Unit U-15	650	8,500
Charles E Long Jr Inc	2	dsl	250	Emsco GA-500	520	10,000/3½ "
Robinson Bros Drlg Co	2	gas	800	Brwstr N-75	800	10,000
Travis Drlrs Inc	1	gas-btne	325	Natl T-20	245	5,000
C D Turner Drlg Co	1	dsl	—	Brwstr N-4	—	5,500
	2	btne	180	Wlsn Mogul	180	4,500
Wes-Tex Drlg Co	5	btne	276	Natl 50	588	8,500
Hunt County						
Maxwell Herring Drlg Corp	2	gas	700	Wlsn Gnt Rdair	700	10,500
Hutchinson County						
Canadian River Drlg Co	1	dsl	300	Unit U-34	300	6,000
Cree Drlg Co Inc	2	gas-btne	255	Unit U-10	360	4,500
	6	gas-btne	255	Wlsn Giant	300	5,000
Drlg & Expl Co of Del Inc	24	gas	225	Wgnr Mrhse	400	5,000
Graham-Michaelis Drlg Co	5	dsl	275	Crdwll B	275	4,000
Service Drlg Co	1	dsl	320	Unit U-34	—	4,500
	8	LPG	300	Unit U-34	—	4,500
Wagner & Wyant Drlg Co Inc	2	dsl	300	Unit U-15	675	8,000
	3	dsl	175	Unit U-34	300	5,000
Irion County						
Brannon & Murray Drlg Co	1	gas-LPG	350	Brwstr N-55	550	7,500
C B Drlg Co	1	gas-gaso	—	—	450	8,000
Dykes Drlg Co	2	dsl	400	Wlsn Giant	600	8,000
Fortune Drlg Corp	1	gas	325	Beth S-55C	524	7,500
Loffland Bros Co	75	gas	970	—	960	11,000
St John Drlg Co	1	gas	400	Wlsn Gnt Rd	700	8,500
Jack County						
Anderson Drlg Co	1	btne	225	Wlsn Mogul	—	4,000
E & H Drlg Co	1	gas	550	Unit U-15	550	7,500
Harvey Drlg Co	3	gas-btne	350	Wlsn Mogul	400	5,000
Leatherwood Drlg Co	2	gas	440	Natl T-32	—	7,000
	5	gas	370	Wlsn Roadair	—	4,000
Ward Drlg Co	2	btne	300	Wlsn Giant	600	5,000
Jackson County						
Allen & Morris	4	gas	400	Natl 50	400	8,500/5"
Boyd & Durst Drlg Contr	2	gas-btne	650	Wlsn Giant	700	8,500
CBS Workover Co	2	gas-btne	145	Crdwll K	145	2,500
Edwards & Bissett Inc	1	gas-btne	800	Wlsn Gnt Rd	800	8,500
Field Drlg Co	1	dsl	1040	Natl 50-A	520	8,500
C J Foster Drlg Co Inc	9	gas-LPG	—	Oilwell 64	412	8,000
Harkins & Co	3	gas-gaso	675	Unit U-15	675	10,000
H H Howell Drlg Co	1	dsl	376	Frnks 5000	248	6,000
Lubie Martin Drlg Co	1	gas	300	Brwstr N-4	200	6,000
Neal Drlg Co	1	gas	750	Emsco G-500	560	9,500
Prince Marine Drlg & Exp Co	7	gas	900	Oilwell 66	900	10,500
Jasper County						
Clegg & Hunt	7	dsl	—	Natl 75	880	11,000
Jefferson County						
Clegg & Hunt	3	dsl	—	Wlsn Titan 56	800	11,500
	9	btne-gas	—	Natl 50-A	—	9,500
Henderson Drlg Corp	2	gas-btne	800	Natl 55	800	11,000
Penrod Drlg Co	14	gas-btne	—	—	756	10,000
Carnes W Weaver Drlg Co	2	gas-btne	900	Ideco	—	11,000

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Avail- able to Drwwks	Rated Depth with 4½ " Pipe
Jim Wells County						
General Well Drlg Inc	1	gas-btne	300	Brwstr N-4	300	5,000
Gilmour Drlg Co	2	gas	500	Natl 50	500	8,500
J E Hillier	2	dsl	400	Ideco H-40	400	7,000
Stice Drlg Co	1	gas-btne	496	Unit U-15	—	7,500
Jones County						
Ace Drlg Co	1	gas	680	Emsco G-500	500	7,500
Andree Drlg Co	1	dsl	310	Unit U-34	310	4,500
Black Drlg Co	1	dsl	160	Franks	250	4,000
Drill Well Oil Co	1	btne	185	Wlsn Super	—	4,000
Hensen Drlg Co	7	btne	275	Crdwll S	202	4,000
J E Miller Drlg Contr	1	btne	165	Natl T-8-S	145	3,400/3½ "
H F Pettigrew Drlg Co	1	—	—	Mayhew Prtble	—	—
West Central Drlg Co	9	gaso-btne	225	Crdwll H	—	3,000
Woodson Prod Co	4	dsl	600	Mayhew 5000	270	5,500
Kaufman County						
Walters Drlg Co Inc	14	gas	—	Mayhew 1000	150	400/2⅛ "
Kenedy County						
Allen & Morris	7	dsl	500	Natl 75	900	10,000/5"
Kent County						
Edgar Davis Drlg Co	12	gas-btne	500	Wlsn Giant	600	10,000
Charles E Long Jr Inc	3	dsl	400	Emsco GA-500	520	10,000/3½ "
Rheay & Reynolds Drlg Co	3	gas	400	Unit U-15	1200	6,500
West Central Drlg Co	8	gaso-btne	325	Wlsn Roadair	—	10,000
Kimble County						
Burger Drlg Co	1	gas	225	Wlsn Super	185	3,500
King County						
Drillers Inc	U-15	dsl	—	Unit U-15	600	7,200
Kleberg (Offshore) County						
C G Glasscock Drlg Co	11	dsl	2000	Natl 130	—	18,000
Kerr-McGee Oil Ind Inc	16	dsl	990	Natl 100	1000	13,000
Knox County						
Allied Expl Co	1	btne	350	Wlsn Rdmaster	—	8,000
Ayers & Burch	2	btne	145	Wlkr-Nr	—	3,000
Bolin Oil Co & D H Bolin	5	gas	225	Wlsn Mogul	190	4,000
T V Gorman Drlg Contr	1	dsl	200	Wichtex R-3	200	3,000
	2	dsl	250	Wichtex R-4	250	4,000
Gray Drlg Co	1	gas-gaso	220	Wlsn Gnt Rd	450	5,500
R Benton Ross Inc	1	dsl	210	Wilson	165	3,100
Harold Shappell Drlg Co	1	gas	245	Wichtex	145	2,800
Smith & Breyer	1	btne	46	Mayhew	—	2,500
Tibbits & Moore Drlg Co	Abb	gas	185	Wlsn Super	225	3,000
Lamb County						
Great Western Drlg Co	4	gas	—	—	800	9,000
Western Drlg Co Inc	14	dsl	375	Emsco 500	375	8,000
LaSalle County						
Kirkwood & Morgan Inc	9	dsl-gas	550	Brwstr N-4	400	6,800
Lavaca County						
Hunt Drlg Co Inc	5	gas	450	Beth M-58	666	11,000
W P Taylor Drlg Co	3	gas	—	Natl	900	11,000
Liberty County						
C J Foster Drlg Co Inc	1	stm	—	Natl	1000+	18,000
Hamman Oil & Ref Co	7	dsl	340	Brwstr N-75	600	11,000
Henderson Drlg Corp	4	gas-btne	1000	Natl B-80	1000	12,500
Houston Oil Well Serv Co	2	dsl	—	Wlsn Titan	1000	10,000
	5	stm	1000+	Natl	1000+	12,000
Liberty Drlg Corp	4	gas-btne	740	Emsco GB-500	—	9,000
Carnes W Weaver Drlg Co	5	gas-btne	465	Unit U-34	—	5,000
	6	gas-btne	540	Brwstr N-7	—	8,500
Lipscomb County						
Cree Drlg Co Inc	1	gas-btne	500	Unit U-15	750	8,500
Great Western Drlg Co	34	dsl	—	—	1200	10,000
Rowan Drlg Co Inc	2	gas-btne	840	Natl 75	1120	11,000
Live Oak County						
Admiral Drlg Co	8	gas-LPG	450	Crdwll O	362	9,500
Del Mar Drlg Co	2	dsl	—	Natl 50	—	8,000
Hunt Drlg Co Inc	4	gas	485	Emsco GB-250	306	7,000
Kirkwood & Morgan Inc	8	dsl	400	Brwstr N-4	400	6,500
Lubbock County						
Thompson Expl Drlg Co	1	dsl	—	—	290	3,500/2¼ "
	5	gas-gaso	—	—	125	2,500/2¼ "
	7	gas-gaso	—	—	100	1,500/2¼ "
	8	gas-gaso	—	—	125	2,500/2¼ "
	10	dsl	—	—	290	3,500/2¼ "
Western Drlg Co Inc	6	dsl	600	—	290	6,000
Madison County						
Trant Drlg Co	2	dsl	—	Ideco	—	12,000
Marion County						
Arrow Drlg Co	14	gas	600	Wlsn	—	8,000

HERE IT IS!

...revolutionary new CASE-TERRATRAC®

"TILT-CROWN" DOZER!



Blade tilts and tips *hydraulically* from operator's seat

Here's just what tractor-operators have wanted for years . . . for ditching, crowning, grubbing, ripping hard ground, etc. It's the new Case-TerraTrac "Tilt-Crown" dozer—a *rugged 8' 8" blade* that tilts and tips to desired angle with the flick of a hydraulic valve-lever. Quick! Simple! Easy! Enables operator to *bull-doze with full efficiency at all times*, without continually having to stop and "wrestle" a big heavy blade into tilt or tip position by hand.

And that's not all! This new torque-converter-equipped dozer also gives you *far more power, speed and ease of maneuverability* than any other crawler in its price range. New patent-applied-for counter-rotating transmission alone practically DOUBLES dozer output because it enables machine to make full 360° turns "in its own tracks"—*thus keep dozing in BOTH directions*, instead of backing up empty. See this sensational "Tilt-Crown" dozer now at your Case Industrial Dealer's, or:

CASE

Famous for quality for over 100 years

Clip . . . mail for free literature

CT-D-15

SPECIAL FEATURES no other rig can claim

1. 80 to 100 HP with power-boosting torque converter.
2. Automatic, high-speed power-shifting transmission.
3. Exclusive 3-way power-steering . . . power-brakes.
4. Blade tilts 14" either side . . . tips 10° fore and aft . . . lifts 34" from ground, with finger-tip controls.
5. Torsion-bar equalizers permit full track oscillation . . . keep blade level for smooth cuts.
6. Automatic track lubrication system cuts greasing interval from once a day to a few times a year.

J. I. CASE COMPANY, Dept. C130, Racine, Wis., U.S.A.

☐ Send literature and prices on new Case-TerraTrac "Tilt-Crown" Dozer

Name _____ Position _____

Company _____

Address _____

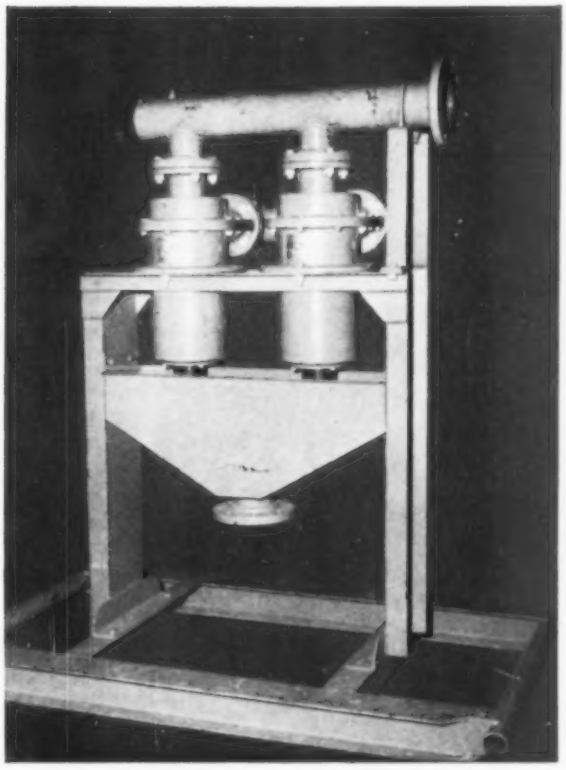
City _____ State _____

Industrial wheel and crawler tractors • dozers • loaders • backhoes • fork lifts

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Carter-Jones Drlg Co	6	gas-btne	—	—	350	6,800
Wheless Drlg Co	2	gas-btne	600	Wisn Atlas	700	8,500
Matagorda County						
Admiral Drlg Co Inc	D	stm	1000+	Natl 9 DMB	1000+	12,000
Bilbo-Redding Drlg Co Inc	9	stm	1050	Emsco ECC	1000+	15,000
Layton Brown Drlg Co	Bge 2	dsl	—	—	800	10,000
	3	stm	—	—	1050	10,000
C J Foster Drlg Co Inc	6	gas-LPG	—	Frnks H-37	260	6,000
Holmes Drlg Co	2	stm	—	Emsco ECA	1000+	15,000
Meadows & Walker Drlg Co	—	gas-btne	1150	Oilwell 76	900	12,000
	3	gas-btne	900	Unit U-15	600	8,500
Penrod Drlg Co	26	gas	—	—	730	9,000
Turnbull & Zoch Drlg Co	1	stm	1600	Emsco	1000+	16,000
Maverick County						
Sutton Drlg Co	1	dsl	—	—	225	3,500
	7	dsl	—	—	225	6,000
McMullen County						
Allen & Morris	8	stm	500	EmscoUBLS-54	1200	12,500/5"
Buzzini Drlg Co	1	gas-btne	150	TIW	150	3,000
J & C Drlg Co	8	gas-btne	800	Beth 650	800	12,000
Richardson & Stewart Drlg Co	5	pwr	1000	Ideco 7-11	1000	12,000
Medina County						
Independent Drlg Co	1	btne	150	Failing 1500	100	2,500/2⅞"
Midland County						
B B M Drlg Co	5	gas-btne	450	Emsco J-750	650	12,000/3½"
	8	gas-btne	450	Beth M-58	650	9,000/4½"
	10	gas-btne	200	Emsco GA-500	450	7,000/3½"
Beckman Inc	11(wo)	gas	300	Unit U-34	300	4,500
Capitan Drlg Co	1	gas	700	Emsco GC-500	700	10,000
Delta Drlg Co	3	gas-btne	900	Natl 100	800	12,000
Great Western Drlg Co	21	gas-gaso	—	—	1260	15,000
	25	gas-gaso	—	—	1125	15,000
Helmerich & Payne Inc	9	gas	1200	Oilwell 96	1100	13,000
Llano Drlg Co	2	gas	—	Natl 100	975	14,000
	3	gas	—	Oilwell 96	975	14,000
	5	gas	—	Natl 100	1050	14,000
McDonald Drlg Co	1	LPG	185	Failing 1500	185	1,500/2⅞"
	1	LPG	315	Failing	315	1,000
Parker Drlg Co	59	gas	—	Natl 75	1000	11,000
A W Thompson Inc	8	gas	350	Beth 58	700	7,500
Tri-Service Drlg Co	6	gas	1350	Oilwell 96	1350	16,000
Vaught Drlg Co	2	gas-btne	225	Crdwll Trirg	200	7,500/2⅞"
Zephyr Drlg Corp	3	gas	1260	Beth 950	1400	20,000/3½"
	10	dsl	1260	Beth Tornado	1250	15,000/4"
	11	gas	1260	Beth 950	1350	20,000/3½"
Mitchell County						
Dykes Drlg Co	1	dsl	500	Oilwell 52T	500	6,500
Montague County						
Henson Drlg Co	5	btne	810	Unit U-15	810	7,500
E W Moran Drlg Co	3	dsl	285	Wisn Giant	650	7,500
	4	gas	300	Unit U-15	650	7,500
Paine Drlg Co	6	btne	350	Wisn Giant	500	7,000
Dwight M Ross Drlg Co	1	gas-btne	300	Wisn Atlas	660	7,500
Ward Drlg Co	1	dsl	350	Wisn Titan	750	6,500
Montgomery County						
Symons Drlg Co	U-15	gas	500	Unit U-15	600	9,500
Moore County						
Cree Drlg Co Inc	3	gas-btne	225	Wisn Giant	300	5,000
Nacogdoches County						
Trant Drlg Co	1	dsl	—	Unit U-15	—	9,000
Navarro County						
M J Delaney Co	21	gas-btne	500	Wisn Titan	600	9,500
Smith & Breyer	4	gas	—	Wisn	—	2,500
Stroube Drlg Co	—	btne	175	Mayhew	175	1,650/2⅞"
Newton County						
Clegg & Hunt	10	gas-btne	—	Natl 50-A	—	9,500
R & M Well Serv & Drlg Co	4	gas-btne	850	Unit U-15	525	9,500
Nolan County						
Camden Drlg Co	2	dsl	600	Natl T-32	300	6,000
M J Delaney Co	24	gas-btne	500	Beth M-58	600	9,500
	31	gas-btne	450	Wisn Gnt Rdr	600	7,000
Foree Drlg Co	2	gas-btne	300	Unit U-15	600	7,500
	4	gas-btne	325	Emsco GA-500	500	7,500
General Geophysical Co	32	btne	—	—	500	7,500
Great Western Drlg Co	14	dsl	—	—	800	9,000
Roy Guffey Drlg Co	6	gas-btne	560	Unit U-15	560	7,500
Moore & Moore Drlg Co	6	btne	300	Unit U-15	636	9,000
Lamar H Moore Drlg Co	3	btne	250	Unit U-15	552	8,000
Oxford & Stasney Drlg Co	1	dsl	530	Wisn Giant	530	7,500
Russan Drlg Co	1	gas	900	Brwstr N-55	600	8,500/4½"
Schoenfeld-Hunter-Kitch Drlg Co	4	LPG-gas	—	Natl 75	800	11,000
Sojourner Drlg Corp	3	dsl	550	Unit U-15	—	7,500
Sonic Drlg & Equip Co Inc	2	dsl	300	Brwstr N-4	265	5,000
	3	gas	300	Wichtex R-5	275	5,000
Nueces County						
Appell Drlg Co	3	gas-gaso	510	Brwstr N-4	225	5,500
Brewster-Bartle Drlg Co Inc	3	dsl	—	Oilwell 96	1500	16,000
Falco Drlg Co	1	gas	475	Brwstr N-45	400	6,500
Field Drlg Co	2	dsl	1500	Unit U-15	1200	9,000
Fitzpatrick Drlg Co	2	gas	950	Unit U-40	900	10,000
General Well Drlg Inc	7	dsl	450	Crdwll	450	6,500
C G Glasscock Drlg Co	9	dsl	400	Natl T-20	—	6,000
	10	dsl	750	Natl 50	—	9,000
Burdette Graham	1	gas-btne	738	Beth M-58	700	9,500
Harkins & Co	6	gas-gaso	675	Unit U-15	675	9,500
Hunt Drlg Co Inc	1	gas	625	Brwstr N-7	513	9,500
J & C Drlg Co	5	dsl	800	Wisn 54	800	12,000
	7	gas-btne	700	Emsco 500	600	9,000
Martin & Holmes O W Serv Co	1	dsl-gas-gaso	770	Crdwll	—	7,000
Joe A Payne Drlg Co	2	gas	550	Emsco GB-500	700	10,000
Nueces (Offshore) County						
C G Glasscock Drlg Co	1	dsl	1200	Natl 110	—	12,500
Ochiltree County						
Arrow Drlg Co	9	gas	560	Emsco 500	—	8,000
Baker & Taylor Drlg Co	5	gas-btne	1800	Natl 110	—	15,000
	6	gas-btne	650	Emsco G-450	—	9,000
	7	gas-btne	1200	Natl 55	—	10,500
Cree Drlg Co Inc	9	gas-btne	350	Unit U-15	650	8,500
Falcon Seaboard Drlg Co	8	gas-btne	450	Beth 450	—	10,000
Loffland Bros Co	98	gas	740	—	640	8,000
Urice Drlg Co	2	gas-btne	720	Emsco GA-500	720	9,000
Webster Drlg Co	2	gas	600	Emsco 450	600	8,000
Orange County						
Meredith & Co	1	gas-gaso-bne	—	Emsco G-500	680	9,500
Panola County						
Carter-Jones Drlg Co	8	gas-btne	—	—	500	7,500
Gibson Drlg Co	2	gas-btne	226	Wisn Mogul 42	145	5,000
Greyhound Drlg Co Inc	2	dsl	600	Brwstr N-45M	600	8,500
Lamar Drlg Corp	1	gas	420	Unit U-15	—	7,500
Tex-Mex Drlg Co	8	stm	—	—	1000+	9,000
	12	gas	—	Unit U-15	—	9,000
Wheless Drlg Co	3	gas-btne	600	Emsco GB-350	600	7,500
Pecos County						
Ainsworth Inc	2	gaso	100	Failing	100	1,500/2⅞"
Blount Drlg Corp	1	gas-btne	700	Wisn Gnt Rdr	700	8,500
	2	gas-btne	675	Unit U-15	675	8,000
Drlg & Expl Co of Del Inc	14	gas-elec	1100	Natl 34-10	1000	17,000
Exploration Drlg Co	14	gas	800	Natl 75-CA	900	11,000
Gardner Bros Drlg Co Inc	11	gas-btne	750	Natl 100	1050	12,500
	15	gas-btne	1000	Oilwell 96	1500	16,000
Great Western Drlg Co	9	dsl	—	—	1600	16,000
Helmerich & Payne Inc	39	gas	1100	Oilwell 96	1300	13,000
Highland Drlg Co	1	gas	—	Natl 50	550	8,200
Charles E Long Jr Inc	1	gas	200	Unit U-10	400	6,000
Parker Drlg Co	26	gas-elec	—	Natl L-10½ FE	2000	20,000
Penrod Drlg Co	12	gas-btne	—	—	1425	14,000
Rowan Drlg Co Inc	28	gas-btne	1200	Natl 125	1480	15,000
Sharp Drlg Co	37	gas	800	Beth MC-450	—	12,000
Thompson Expl Drlg Co	4	dsl	—	—	290	3,500/2⅞"
Tullous Drlg Co	1	dsl	250	Emsco 250	340	5,000
Urice Drlg Co	3	gas-btne	640	Emsco GB-500	640	9,000
Reins County						
Iran Drlg Corp	2	gas	350	Wisn Giant	300	7,500
Reagan County						
Empire Drlg Co	3	gas	500	Brwstr N-75	975	11,000
Hewgley Drlg Co	5	dsl	—	Emsco J-750	975	11,000
Baker B Ingram Inc	1	gas	550	Unit U-15	550	8,500
Laughlin-Porter Drlg Co Inc	5	dsl	1080	Natl 23-9FEB	—	12,000
McQueen & Stout Drlg Co	10	LPG	225	Crdwll RL	185	4,500
Milestone Drlg Co	100	dsl	550	Ideco H-525	600	7,500
Schoenfeld-Hunter-Kitch Drlg	9	LPG-gas	—	Natl 75	900	11,000
Urice Drlg Co	6	gas-btne	325	Wisn Super	145	3,000
Reeves County						
McDaniel & Beecherl Drlg Co	11	gas-gaso	—	Hou Prtble	—	5,000
Parker Drlg Co	44	gas	—	Natl L-125	1400	15,000
Western Serv Drlg Co Inc	8	gas-btne	600	Beth MC-650	700	11,000
Refugio County						
Layton Brown Drlg Co	1	gas-gaso	—	—	400	6,500
Dillingham Drlg Co	1	gas-btne	530	Wisn Giant	460	7,500
Harkins & Co	5	gas-gaso	675	Unit U-15	675	10,000
Rock Hill Drlg Co	4	gas-gaso	450	Unit U-10	500	7,500

HERE IT IS...
a new 2-DorrClone
Dorrco
D-Sander

—designed especially for hard formation drilling



The new Size 2 Dorrco D-Sander is low in both first cost and operating cost. In addition, it is light in weight and easy to move. Designed especially for hard formation drilling with any rig, or slim hole drilling in a wide variety of formations, it brings the benefits of drilling fluids substantially free of drilled solids within the reach of every operator.

The benefits from using Dorrco D-Sanders are many. In many fields along the Gulf Coast, as well as other areas, abrasive sand can seriously reduce the life of bits and pump parts unless a D-Sander is used. In addition, the high viscosity of mud laden with drilled solids reduces drilling rates as much as 25 per cent.

In these areas, important savings in drilling costs result in that section of the hole where unweighted mud can be used.

But recent experience has proved that savings can also be realized in many other areas where abrasive formations are not encountered. In these areas, "flour sand" Dorrco D-Sanders, set to remove all drilled solids above 30 microns in size, result in greatly improved drilling speeds—sometimes in excess of 15 per cent.

In harder formations, drilling rates are slower and drilled solids are produced at a lower rate. In many of these areas, the Size 2 D-Sander, which provides capacities up to 250 gpm, is entirely adequate, yet it costs less to buy, to move and to operate than larger units.

The new Size 2 D-Sander compliments the capacity ranges of the larger sizes 4 and 6. With this new addition, Swaco offers units suitable for any rig and any drilling condition. Write for full information.

SWACO

SALT WATER CONTROL Inc.

A Sid Richardson Development Company

1211 Ft. Worth National Bank Phone: ED 2-4434 Ft. Worth, Texas

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Schimmel Drlg Co	1	dsl	350	Wisn Gnt Torcr	450	7,500
	1	dsl	450	—	—	7,500
Roberts County						
Cree Drlg Co Inc	5	gas-btne	825	Unit U-40	975	14,000
Moran Bros Inc	4	gas	1100	Wisn Titan	1300	15,000
Webster Drlg Co	9	gas	—	Natl 100	1110	14,000
Runnels County						
Brannon & Murray Drlg Co	2	gas-LPG	350	Emsco GA-350	550	6,500
Frank Caraway Drlg Co	1	btne-gas	225	Beth S-50	—	5,000
Gilchrist Drlg Co	2	btne	250	Wisn Giant	250	6,000
Hack Drlg Co	3	btne	—	Unit U-15	412	8,500
Johnn Drlg Co	2	gas	375	Unit U-15	400	7,500
	5	gas	375	Unit U-15	600	8,500
Moore & Moore Drlg Co	4	btne	175	Unit U-34	210	5,000
Paine Drlg Co	7	dsl	350	Wisn Giant	450	7,000
St John Drlg Co	2	gas	300	Natl 50	450	7,000
Tex-Mex Drlg Co	7	gas	400	Emsco 250	450	5,500
	9	gas	—	Emsco GB-350	—	7,000
Wes-Tex Drlg Co	3	btne	225	Crdwll B	326	6,500
Rusk County						
Halbert Drlg Co	1	gas-btne	255	Wisn Torcair	285	5,500
Johnson Drlg & Serv Co	1	dsl	200	Beth-Breeze	200	4,500
South States Drlg Co	1	dsl	330	Crdwll O	520	6,500
J C Trahan	1	gas	740	Unit U-15	600	9,500
	2	gas	600	Unit U-15	600	9,500
San Jacinto County						
Edwards & Bissett Inc	3	gas-btne	1100	Brwstr N-75	800	10,500
San Patricio County						
Bay City Drlg Co Inc	4	gas-btne	420	Brwstr N-45	420	7,500
Del Mar Drlg Co	1	stm	800+	Alco BIW 12	1000	11,000
Miller Bros & Bowling	1	gas-btne	495	Emsco G-300	—	5,500
The Oil Corp	4	gas-btne	300	Unit U-15	—	7,500
Joe A Payne Drlg Co	1	gas	550	Emsco G-500	500	8,500
Turnbull & Zoch Drlg Co	2	stm	1600	Ideco	1000+	14,000
Schleicher County						
Fortune Drlg Corp	2	gas	330	Unit U-15	590	7,500
Gore Drlg Co	2	dsl	320	Beth	—	5,000
Henson Drlg Co	4	btne	825	Unit U-15	825	7,500
Tucker Drlg Co	1	gas	600	Brwstr N-55	—	9,500
	3	gas	600	Ideco TC-600	—	9,500
Western Serv Drlg Co Inc	13	gas-btne	550	Beth S-45-E	350	5,000
Scurry County						
Calco Drlg Co	1	gas-btne	225	Mayhew 3000	200	3,500
Rheay & Reynolds Drlg Co	5	gas	350	Natl 50	1200	7,000
Rhodes Drlg Co	1	gas	300	Wisn Gnt	450	5,500
	11	gas	240	Emsco 350	360	5,000
Smith & Breyer	2	gaso	—	Cooper	—	3,000
Western Drlg Co Inc	20	btne	325	Ideco M-10,000	325	9,000
Shackelford County						
Gore Drlg Co	1	dsl	640	Shovel Spl	—	7,500
Low Drlg Co	1	btne	—	Emsco	290	7,000
Oxford & Stasney Drlg Co	3	dsl	400	Brwstr N-4	265	5,000
D L Rose Drlg Contr	1	btne	450	Unit U-15	450	7,500
Sojourner Drlg Corp	4	btne	225	Unit U-34	—	4,500
Varner-Neill Drlg Co	1	gas	500	Wisn Giant	450	6,000
Wes-Tex Drlg Co	2	btne	244	Brwstr N-4	280	5,500
Shelby County						
United Drlg Co (Texas)	2	gas-btne	600	Beth M-58	750	10,000
Sherman County						
Cree Drlg Co Inc	8	gas-btne	185	Unit U-34	300	4,500
Moran Bros Inc	11	dsl	300	Wisn Giant	350	5,000
Wagner & Wyant Drlg Co Inc	4	gas-btne	300	Unit U-15	700	9,000
Smith County						
B G Byars Power Drlg Co	1	gas-btne	1170	Beth MC-450	775	11,000
Gibson Drlg Co	4	gas-btne	226	Wisn Mogul	225	4,500
Maxwell Herring Drlg Corp	3	gas	500	Wisn Gnt Rdr	500	9,500
Liberty Drlg Corp	2	gas-btne	675	Unit U-15	—	9,000
Starr County						
Clark Fuel Prod Co	1	dsl	260	Natl T-8-S	140	2,500
Hugh Kirkpatrick Inc	1	gas	696	TIW 5	712	8,000
	2	gas	1080	Natl 55-A	600	10,000
	3	gas	1090	Natl 50-A	750	9,000
Turnbull & Zoch Drlg Co	3	gas-btne	1125	Wisn Titan	1125	16,000
	5	gas-btne	850	Unit U-15	850	9,500
Stephens County						
E & H Drlg Co	2	gas	275	Unit U-34	225	4,500
Ewing Drlg Co	1	btne	—	Emsco C-42	450	5,000
Irish Drlg Co Inc	3	btne	285	Wisn Mogul	—	4,000
A F Knappenberger & K & H Drlg Co	1	gas	350	Emsco GA-500	500	7,000
Lamar H Moore Drlg Co	2	btne	250	Wisn Giant	480	7,000
Fred Pool Drlg Co	1	gas	580	Unit U-15	600	7,500
Red River Drlg Co	1	dsl	200	Wichtex R-4	165	3,000
Sterling County						
Rheay & Reynolds Drlg Co	4	gas	350	Natl 50	1200	7,000
Woodson Prod Co	2	gas	600	Unit U-15	900	8,500
Stonewall County						
C B Drlg Co	4	gas-gaso	—	—	450	8,000
Empire Drlg Co	2	gas	500	Brwstr N-7	675	9,500
Gilchrist Drlg Co	5	btne	700	Unit 40	700	9,000
O E Hall Drlg Co	2	gas	320	Unit U-15	700	8,000
J & L Drlg Co Ltd	1	dsl	—	Brwstr N-55	500	7,200
Mc Cutchen & Graham	2	btne	255	Unit U-15	570	7,500
D L Rose Drlg Contr	2	dsl	450	Beth S-55	500	7,500
Wes-Tex Drlg Co	6	btne	675	Unit U-15	675	9,500
Sutton County						
Great Western Drlg Co	5	gas-gaso	—	—	750	7,500
	11	dsl	—	—	500	9,000
Taylor County						
Dykes Drlg Co	3	gas	400	Natl 50	650	8,000
Foree Drlg Co	3	gas-btne	325	Unit U-15	600	7,500
Gilchrist Drlg Co	4	btne	450	Unit U-10	450	6,000
Henson Drlg Co	1	btne	825	Unit U-15	825	7,500
	2	btne	540	Unit U-15	540	7,500
Johnson-Gadbois Drlg Co	2	gas	230	Natl T-20	—	5,500
J E Miller Drlg Contr	2	btne	200	Natl T-12	165	4,000
Moore & Moore Drlg Co	5	btne	175	Unit U-34	210	5,000
Norman Oil Corp	2	dsl	330	Unit U-10	350	5,000
Slim Rae Drlg Co	1	dsl	275	Brwstr N-1	—	6,000
Thomas & Billups Drlg Co	1	btne	550	Unit U-15	590	8,000
Terry County						
Great Western Drlg Co	29	dsl	—	—	750	7,500
Helmerich & Payne Inc	32	gas	1100	Oilwell 96	1100	13,000
Carl B King Drlg Co of Tex	7	gas-gaso	1000	Natl 100	1000	13,500
Laughlin-Porter Drlg Co Inc	2	gas	740	Unit U-15	—	7,500
Lowe Drlg Co	8	gas	1200	Natl 80	—	12,500
Midland Drlg Co	1	gas-btne	600	Unit U-15	600	8,000
Throckmorton County						
Hack Drlg Co	1	btne	—	Unit U-15	412	8,500
Lamar H Moore Drlg Co	1	btne	173	Crdwll RL	210	5,000
R-G Drlg Co	2	gas-gaso	—	Wisn	650	8,000
	3	gas-gaso	—	Wisn	450	6,500
Sheets & Walton Drlg Co	3	btne	—	Brwstr N-4	225	4,500
Taylor Expl Co Inc	1	btne	—	Mayhew	125	3,000
Tom Green County						
Alvon Drlg & Expl Co	1	dsl	370	Nat 50-A	450	8,500
	2	gas	740	Emsco J-750	750	12,000
C B Drlg Co	3	gas-gaso	—	—	450	9,000
Dykes Drlg Co	4	gas	500	Wisn Atlas	1000	10,000
Tucker Drlg Co	2	gas	425	Brwstr N-4	—	6,500
	4	dsl	610	Beth J-55	—	9,500
Trinity County						
Delta Drlg Co	17	gas-btne	1020	Emsco J-1100	1300	15,000
Tyler County						
Lusk Drlg Co	12	gas	1360	Beth M-810	1000	12,500
Upton County						
B B M Drlg Co	4	gas-btne	400	Natl 50	600	8,500 3½"
Harry Bass Drlg Co	111	gas	1200	Emsco	1200	14,000
Beckman Inc	1(wo)	gas	185	Unit U-10	350	6,000
Brown & Thorp Drlg Co	12	btne	250	Natl T-20	350	6,500
	14	btne	250	Natl T-12	200	4,000
Curtis & Lomax Drlg Co	111	gas-btne	850	Natl 75	850	10,500
Gardner Bros Drlg Co Inc	10	gas-btne	750	Natl 100	1050	12,500
Helmerich & Payne Inc	37	gas	1200	Oilwell 96	1450	15,000
J E Jones Drlg Co	2	gas	500	Unit U-15	663	7,500
	3	gas	370	Natl 50	670	7,500
Laughlin-Porter Drlg Co Inc	4	gas	1650	Ideco 1350	—	14,000
Marcum Drlg Co	3	gas-btne	500	Emsco GA-500	700	9,000
Penrod Drlg Co	32	dsl	—	—	1460	15,000
Western Serv Drlg Co Inc	7	gas-btne	600	Natl 50	700	7,000
Wilbanks & Rutter Drlg Co	1	gas	675	Unit U-15	600	8,000
Val Verde County						
Delta Drlg Co	4	gas-btne	800	Natl 100	800	12,000
Hewgley Drlg Co	2	gas-btne	—	Ideco	1400	14,000
Rowan Drlg Co Inc	27	gas-btne	1200	Natl 125	1480	15,000
Victoria County						
Allen & Morris	3	stm	500	Emsco H-46M	1260	11,000 5"
Glenn Drlg Co	3	gas	145	Crdwll S	145	4,000
J & C Drlg Co	2	stm	600+	Emsco H-46	700+	9,000
	3	gas-btne	450	Natl 50	450	7,500
Chet Whaley Well Serv Co	2	gas-gaso-btne	225	Wisn Giant	275	5,500 3½"

IT'S BRAND NEW!

The O-C-T UNIVERSAL TUBING HEAD

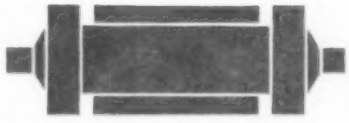
. . with 6 interchangeable dual string and single string tubing hangers!

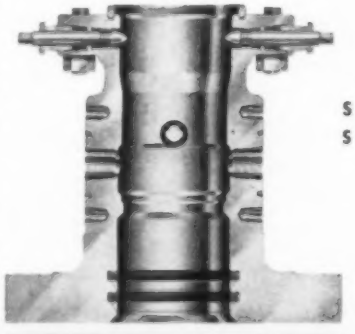
The new O-C-T universal tubing head is available with a complete range of interchangeable tubing hangers for both dual and single strings. Last minute changes in completions can be made without changing tubing heads or using special attachments. If only one producing sand is found in a proposed dual well, the well may be completed by using a single string hanger. If a second sand is found in a well originally scheduled for single completion, the well may be completed with a dual hanger instead of the single hanger originally contemplated.

The O-C-T universal tubing head is equipped with two retractable aligning screws which are used to align the dual hanger with respect to the head itself. These aligning screws are retracted when single string hangers are used.

Safety is assured, since all hangers are run through, landed and locked in place prior to the removal of blowout preventers. Once the head has been installed, all seals can be field tested through test ports located in the flanges.

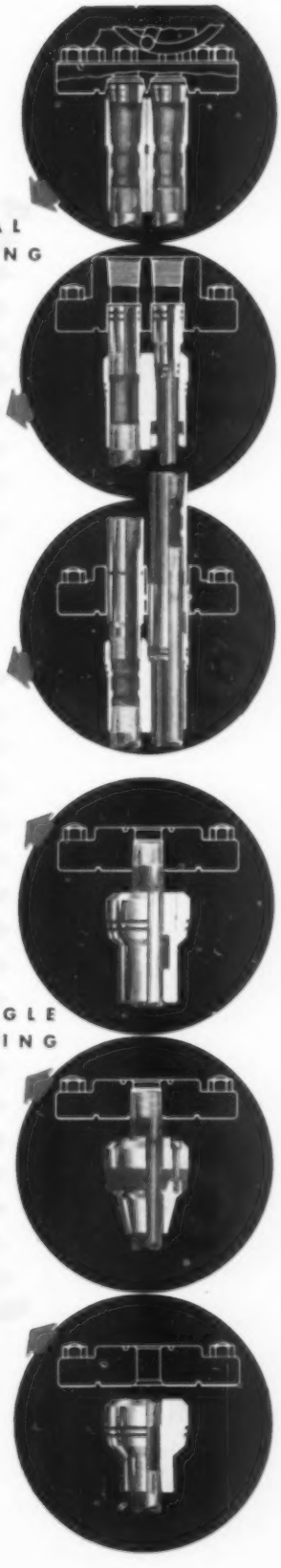
This universal head is available in 600 through 2900 series and flange sizes from 6" to 10". If an operator does not desire to remove the existing tubing head in order to dually complete a well, an adapter is available.





Any of six interchangeable hangers may be landed and locked in place through blowout preventers

All seals may be tested by a single application of pressure through a test port in the top adapter flange



O·C·T

OIL CENTER TOOL CO.

Export Representatives: South America — East West Oiltools, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Ward County						
Delta Drlg Co	33	gas-btne	624	Natl 50-A	450	7,000
Lloyd R French Co	1	gas-btne	300	Unit U-10	300	4,500
Hissom Drlg Co	3	gas	450	Beth S-60	450	6,500
Loffland Bros Co	123	gas	1350	—	1350	14,000
M & J Inc	14	gas	150	Crdwll RL	—	3,500
B L McFarland Inc	4	gas	400	Crdwll RL	—	4,500
O'Neal Drlg Co	—	gas-gaso	—	Emsco 450	450	6,500
Sharp Drlg Co	35	gas	1150	Beth M-810	1000	12,000
Woodson Prod Co	3	gas	300	Mayhew 3000	200	4,000
Wharton County						
Appling Drlg Co Inc	1	stm	—	—	—	8,500
	3	stm	—	—	—	10,000
B B M Drlg Co	3	stm	—	Emsco UBLS-54-10	—	14,000
W P Taylor Drlg Co	2	gas	—	Natl	900	11,000
Wichita County						
Dublin-Kiel	1	LPG	225	Wisn Mogul	190	2,500
Jim Fish Drlg Co	1	gas	165	Wilson	140	4,000
Harvey Drlg Co	5	gas-btne	750	Wisn Giant	800	8,500
	6	gas-btne	500	Wisn Giant	500	7,500
Hull Oil Co	1	btne	140	Wikr-Nr R-2	—	2,000
Lin-Mour Drlg Co	1	gas	315	Wisn Mogul	400	4,600
Loggie Bros	7	btne	97	Wikr-Nr R-2	97	2,000
Gene McCutchin	8	gas	550	Natl 50	550	8,000
Schulz & Brannan Drlg Co	1	dsl	400	Wisn Mogul	400	5,000
Wilbarger County						
Graham Drlg Co	1	dsl	300	Wilson	200	4,500
Jennings Drlg Co	4	btne-gas	450	Unit U-15	600	8,000
Lofton Drlg Co	1	btne	300	Beth Breeze	—	5,500
Frank T Wolfe	1	btne	115	Wisn Mogul	—	2,500
Wilson County						
Sutton Drlg Co	6	dsl	—	—	225	6,000
Winkler County						
Harry Bass Drlg Co	115	gas	1200	Emsco	1200	12,000
Bolin Oil Co & D H Bolin	7	gas	225	Beth S-50	185	4,500
Coroco Drlg Co	4	gas-gaso	650	Wisn Spr Titan	900	15,000
Dixilyn Drlg Corp	4	gas	950	Natl 80	950	14,000
Gardner Bros Drlg Co Inc	20	gas-btne	275	Natl T-25	350	4,000
Johnn Drlg Co	3	gas	650	Wisn Atlas	900	10,000
King-Phillips Inc	3	dsl	622	Ideco H-40D	—	5,500/4"
Loffland Bros Co	89	gas	970	—	1050	11,000
B L McFarland Inc	9	gas	400	Crdwll RL	—	4,500
McQueen & Stout Drlg Co	9	LPG	225	Crdwll RL	185	4,500
L H & S A Olson Drlg Co	3	gas	670	Natl 75	750	10,000
O'Neal Drlg Co	—	gas-gaso	—	Beth S-45-E	200	5,500
Western Serv Drlg Co Inc	2	gas-btne	600	Natl 50-A	700	8,000
	12	dsl	250	Natl T-20	520	4,000
Wise County						
Alan Drlg Co	1	gas	350	Wisn Giant	850	9,000
Carter-Jones Drlg Co	7	gas-btne	—	—	300	6,500
	11	gas-btne	—	—	280	6,500
John W Harris Drlg Co	1	gas	500	Hou Prtble	450	6,500
	2	gas	500	Emsco G-500	500	8,000
	3	gas	640	Emsco GC-500	640	8,000
	4	gas	640	Emsco GB-500	640	8,000
John Haseman Inc	2	gas-btne	150	Wisn Super	150	3,500
	3	gas-btne	450	Cooper	175	4,500
Johnson-Gadbois Drlg Co	5	gas	410	Wisn Mogul	—	4,000
Leatherwood Drlg Co	1	gas	600	Ideco 750	—	10,000
Pan-Tex Drlg Co	1	gas	350	Brwstr N-45	400	6,500
Rankin Karper & Glass	3	dsl	450	Beth S-55	450	7,000
Tibbits & Moore Drlg Co	3	gas	350	Wisn Giant	560	7,500
Trio Drlg Co	1	dsl-gas	520	Wisn Giant	—	8,000
	2	dsl-gas	520	Crdwll O	—	8,500
	3	gas	450	Wisn Giant	—	6,500
	4	gas	450	Natl 50	—	6,500
Walters Drlg Co Inc	12	dsl	—	Mayhew 1000	300	400/2½"
Wood County						
M J Delaney Co	25	stm	—	Emsco UBLS 54	—	15,000
	28	gas-btne	500	Oilwell 96	1000	14,000
Delta Drlg Co	7	stm	750	Emsco UB-54	1200	12,000
Iran Drlg Corp	3	gas	250	Crdwll RL	185	5,000
Yoakum County						
Brantley Drlg Co Inc	8	gas	675	Beth 450	870	11,500
Cactus Drlg Corp of Tex	1	gas-btne	1575	Natl 110	1575	15,000
Durham Drlg Co Inc	4	gas	1250	Ideco 7-11	1450	15,000
Gardner Bros Drlg Co Inc	14	gas-btne	750	Natl 130	1050	12,500
Great Western Drlg Co	33	gas-gaso	—	—	675	7,500
Rowan Drlg Co Inc	25	gas-btne	1260	Natl 100	1680	14,000
Western Drlg Co Inc	11	dsl	288	Emsco 350	375	6,500
	15	dsl	375	Emsco 500	375	8,000
	21	btne	650	Natl 100	325	10,000
Young County						
Bolin Oil Co & D H Bolin	9	gas	195	Wisn Super	145	4,000
Hamilton-Powell Drlg Co Inc	1	gas	225	Wisn Mogul	—	4,500
A F Knappenberger & K & H Drlg Co	2	gas	200	Wisn Mogul	400	5,000
E W Moran Drlg Co	2	gas	500	Wisn Giant	650	7,500
	5	gas	370	Natl 50	650	7,500
Oney Drlg Co	5	gas	250	Crdwll S	200	4,000
Louis Pitcock Drlg Co	1	gas-btne	225	Beth S-55	600	7,500
Rankin Karper & Glass	2	gas	425	Beth C-50	425	6,000
	5	dsl	276	Beth S-45	276	5,500
	6	gas	276	Wilson	212	3,500
Taylor Expl Co Inc	4	gaso	—	Mayhew	75	1,000
	5	gaso	—	Mayhew	75	1,000
Zavala County						
Harkins & Co	2	dsl	300	Wisn Giant	300	6,000
UTAH						
Carbon County						
A O Bullock Drlg Co	2	gas	225	Crdwll S	—	4,000
Carmack Drlg Co	7	dsl	300	Natl T-12	300	4,000
Emery County						
Camay Drlg Co Rocky Mt Div	1	gas	730	Unit U-15	600	8,000
Great Western Drlg Co	42	dsl	—	—	800	9,000
Garfield County						
Falcon Seaboard Drlg Co	18	dsl	700	Whind B-85	—	10,000
Grand County						
Anschutz Drlg Co Inc	4	gas	800	Wisn Giant	600	8,500
Kane County						
Falcon Seaboard Drlg Co	25	dsl	225	Beth Twstr	—	6,500
San Juan County						
Anschutz Drlg Co Inc	2	dsl	900	Wisn Giant	560	8,500
Calvert Drlg Inc	20	dsl	350	Ideco H-525	600	8,500
Camay Drlg Co Rocky Mt Div	5	gas	680	Natl 50-A	450	7,500
D K Drlg Co	1	gas	675	Natl 50	675	7,500
	3	gas	500	Natl 50	500	6,500
Exploration Drlg Co	4	gas	625	Unit U-15	600	8,000
	8	gas	670	Unit U-15	600	8,000
	10	gas	505	Unit U-15	400	8,000
Great Western Drlg Co	20	dsl	—	—	600	5,500
	30	gas-gaso	—	—	750	7,500
	31	gas-gaso	—	—	840	9,000
	36	gas-gaso	—	—	675	7,500
Jet Drlg Co Inc	2	dsl	600	Brwstr N-7	600	8,000
Moran Bros Inc	9	gas	700	Oilwell 66	750	10,000
	7	gas	700	Wisn Giant	750	10,000
Mountain States Drlg Co Inc	4	gas-dsl	600	Emsco GB-500	—	9,000
George Noland Drlg Co Inc	8	gas-btne	—	Emsco GA-500	730	8,500
	9	gas-btne	—	Emsco G-500	730	8,500
R W Rine Drlg Co	2	dsl	520	Brwstr N-7	600	8,500
	6	dsl	520	Brwstr N-75	520	8,500
Paul F Rutledge	4	gas	450	Beth C-50	—	7,000
Sanpete County						
Exploration Drlg Co	15	gas	800	Natl 75-CA	900	11,000
Sevier County						
Mountain States Drlg Co Inc	11	gas-dsl	1000	Natl 80-B	—	12,500
Uintah County						
Bauman Drlg Co	1	dsl	—	Wisn Atlas	600	10,000
Kerr-McGee Oil Ind Inc	4	gas	725	Natl 75	832	11,000
	23	gas	650	Natl 50	556	8,000
	42	gas	870	Natl 75	818	11,000
Loffland Bros Co	27	gas	970	—	1100	11,000
Utah County						
Mountain States Drlg Co Inc	2	gas-dsl	1000	Emsco J-750	—	10,000
WASHINGTON						
Thurston County						
Colorado Wyoming Drlg Co	2	dsl	600	Natl 55	600	12,000
WEST VIRGINIA						
McDowell County						
Delta Drlg Co	27	dsl	380	Emsco GA-350	350	6,000
Pleasants County						
Henry Gwaltney Drlg Co	2	gas-prop	200	Crdwll	165	3,000
WYOMING						
Albany County						
Mountain States Drlg Co Inc	3	gas-dsl	600	Natl 50-A	—	7,500
True Drlg Co	7	dsl	185	Failing	165	3,500
Big Horn County						
Carpenter-Trant Drlg Co	4	dsl	423	Unit U-34	400	5,500
True Drlg Co	9	gas-gaso	1200	Unit U-40	1200	11,000

Maximum Areas for Free Passage of Fluids!

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...you get *BOTH* in these *NEW* Valves and Seats

...Designed Exclusively for "Oilwell" and Wilson-Snyder Slush Pumps

THESE NEW "Oilwell" fluid valves and seats are the result of intensive research . . . to design a valve that would permit free movement of drilling fluids through the passage areas, yet provide adequate metal-to-metal contact areas between the valve seat and the valve body to withstand wear from both abrasion and impact.

TRY A SET of these new valves and seats and find out for yourself how well they do their job when compared with other makes.

YOU'LL FIND

among other things . . .

(1) that the controlled-quality rubber inserts have outstanding wear-resistant characteristics;

(2) that replaceable upper and lower guide bushings practically eliminate valve-stem wear;

(3) that the combined design features of this valve make it highly adaptable to the pumping of "lost circulation" materials;

(4) and that the accurately-ground outside diameter of the valve seat minimizes the possibility of washouts in the fluid chambers.

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USS TRADE MARK

"OILWELL"

TRADE MARK

UNITED STATES STEEL

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Campbell County						
Progressive Drlg Co Inc	1	gas	325	Beth Twister	550	8,000
Reserve Drlg Co	3	gas-gaso	500	Natl 50	500	7,500
A L Schlaikjer	1	gas	700	Wlsn Gnt Rdr	—	8,000
Carbon County						
Dellson Drlg Co	1	gas-btne	320	Emsco GB-500	807	8,500
Exploration Drlg Co	1	gas	310	Beth S-60	250	6,000
Pioneer Drlg Co Inc	5	dsl	850	Emsco J-750	1000	12,000
Converse County						
Anschutz Drlg Co Inc	9	gas	800	Natl 50-A	600	8,500
Dellson Drlg Co	3	gas-btne	255	Emsco GB-500	540	8,000
Crook County						
Black Hills Drlg Co Inc	2	dsl	1000	Emsco GA-500	—	12,000
True Drlg Co	8	gas-gaso	500	Natl 50	500	7,500
Fremont County						
Ainsworth Inc	3	btne	100	Joy	100	3,000/2⅞"
	4	btne	100	Joy	100	2,000/2⅞"
Carpenter-Trant Drlg Co	7	dsl	400	Brwstr N-4	325	5,000
Dellson Drlg Co	2	gas-btne	255	Emsco GA-250	320	6,000
Loffland Bros Co	137	dsl	1000	—	1200	14,000
Lohmann-Johnson Drlg Co Inc	2	gas	500	Oilwell 76	750	10,000
R L Manning Co	11	gas-btne	1080	Emsco J-1000	1305	13,000
	15	gas-btne	540	Emsco GB-250	340	6,000
Roden & McRae Drlg Corp	1	dsl	255	Emsco GA-350	570	5,000
True Drlg Co	5	elec	400	Emsco H-46	400	9,000
Hot Springs County						
Anschutz Drlg Co Inc	10	dsl	800	Brwstr N-55	600	7,500
Dyer Drlg Co	1	gas-gaso	325	Natl T-32	365	6,000
R L Manning Co	5	gas-btne	750	Emsco G-500	750	8,000
Roden & McRae Drlg Corp	5	gas	255	Emsco GA-250T	270	4,500
Lincoln County						
Brack Drlg Co Inc	6	dsl	—	—	606	8,500
Natrona County						
Anschutz Drlg Co Inc	8	gas	900	Unit U-15	600	8,500
	11	gas	1000	Wlsn Giant	700	8,500
A O Bullock Drlg Co	3	gas	370	Beth Twister	—	7,500
Carpenter-Trant Drlg Co	1	btne	185	Crdwl RL	185	3,000
	5	dsl	900	Brwstr	900	12,000
Delta Drlg Co	28	dsl	350	Frnks SAL-6000	600	5,000
Hose-Austin Drlg Corp	3	gas	450	Unit U-15	550	7,000
Don Jonhston Drlg Co	5	gas-btne	775	Natl 75	650	10,000
R L Manning Co	16	gas-btne	475	Natl T-32	450	6,000
Mountain States Drlg Co Inc	12	gas-gaso	600	Emsco PDM-46	—	7,500
Roden & McRae Drlg Corp	2	dsl	185	Emsco GA-300	270	4,500
	6	dsl	122	Frnks Rocket	180	2,000
True Drlg Co	4	gas-gaso	400	Emsco GA-250	250	6,000
Niobrara County						
A O Bullock Drlg Co	1	gas	225	Wichtex R5	—	3,500
George Noland Drlg Co Inc	6	gas-btne	—	Wlsn Mogul	440	4,000
Park County						
R L Manning Co	12	gas-btne	550	Emsco GA-350	450	7,000
Mountain States Drlg Co Inc	9	gas-dsl	1400	Natl 125	—	15,000
Sublette County						
Delta Drlg Co	23	dsl	520	Emsco GA-500	500	8,500
Loffland Bros Co	7	gas	970	—	960	11,000
Sweetwater County						
Camay Drlg Co Rocky Mt Div	3	dsl	510	Natl 50-A	450	7,500
Delta Drlg Co	25	gas-btne	1520	Emsco J-1250	1250	15,000
Mountain States Drlg Co Inc	15	gas-dsl	1400	Natl 125	—	15,000
Signal Drlg Co	4	gas	300	Ideco H-25	300	3,500
Washakie County						
Anschutz Drlg Co Inc	7	gas	900	Unit U-15	600	8,500
Carpenter-Trant Drlg Co	6	dsl	450	Wlsn Giant	640	7,500
Clark Drlg Co	—	dsl	—	Natl 50	525	6,500
Delta Drlg Co	18	dsl	600	Natl 75	650	9,500
Kerr-McGee Oil Ind Inc	28	gas	870	Natl 75	832	11,500
	31	gas	1000	Natl 100	1680	15,000
R L Manning Co	4	gas-btne	600	Emsco 450	450	7,000
	6	gas-btne	900	Emsco GB-800	1125	11,000
George Noland Drlg Co Inc	10	gas-btne	—	Emsco PDM-36	440	5,500
Weston County						
Black Hills Drlg Co Inc	1	dsl	450	Emsco GA-350	—	7,500
Brack Drlg Co Inc	4	dsl	—	—	254	5,500
True Drlg Co	6	gas-gaso	500	Beth Twstr	600	8,500

U. S. Contract CABLE TOOL Drilling Rigs

Contractor's Name	Rig No.	Type Power	HP of Driving Engine	Top to Bottom Drlg Cap.	Workover and Cleanout Depth Cap.	Rig Make and Model
		ARKANSAS				
Columbia County						
E G Bradham	1	LPG-gas	180	6000	10,000	Crdwll S
	1	LPG-gas	145	7000	10,000	Brwstr N-4
Union County						
H F Hatcher & Son	1	gas-gaso-btne	140	4000	5500	Crdwll KL-225
		CALIFORNIA				
Los Angeles County						
Southern Drlg Co	1	gas	145	3500	5000	Crdwll H
Ventura County						
United Drlg Co	2	gas	75	2000	—	Keystone A-5
		COLORADO				
Routt County						
Western Drlg Co Inc	7	dsl	185	—	—	B Erie 48L
Washington County						
Signal Oilfield Serv	4	dsl	200	—	8000	Crdwll RL
		ILLINOIS				
Bond County						
W L Dillier	2	gas	65	1500	2000	B Erie 60-L
Christian County						
L A McElmurray	—	gas	75	2000	2500	B Erie 24-L
V S & S Drlg Co	1	gas	—	—	2000	Wichtex
Clark County						
W L Dillier	1	gas	65	1500	2000	B Erie 60-L
Donald P Knierim	1	gas	65	1500	2000	B Erie 60-L
Perrine & Perrine Drlg Contr	2	btne	145	—	6000	B Erie 36-L
Clay County						
Shulman Bros	1	gas-gaso	—	4000	—	Crdwll H
	2	gas-gaso	—	4000	—	Crdwll H
Coles County						
Cummins Drlg Co	C-6	gas-gaso	78	2500	3500	B Erie 28-L
C W Strotman Drlg Co	1	gas	145	3600	4500	Crdwll H
	2	gas	145	3600	4500	Crdwll H
Fayette County						
Cummins Drlg Co	C-1	gas-gaso	65	1500	2000	B Erie 24-L
	C-2	gas-gaso	65	1500	2000	B Erie 24-L
	C-3	gas-gaso	65	1500	2000	B Erie 60-L
	C-4	gas-gaso	65	1500	2000	B Erie 60-L
	C-5	gas-gaso	78	2500	3500	B Erie 28-L
Gallatin County						
V S & S Drlg Co	3	gas	—	3500	3500	Cooper
Hamilton County						
C E Brehn	4	btne	—	—	—	Crdwll K
	8	btne	—	—	—	Crdwll K
Jasper County						
Don Slape Drlg Co	1	btne	—	—	—	Crdwll K
Lawrence County						
W L Dillier	3	gas	65	1500	2000	B Erie 60-L
Payne Bros Drlg Co	1	dsl	150	3000	4000	B Erie 36-L
	2	dsl	150	3000	4000	B Erie 36-L
Marion County						
Graham Powell	1	btne	500	4200	4200	B Erie 36-L
Saline County						
C W Strotman Drlg Co	3	gas	130	3000	3500	Crdwll K
Wabash County						
Payne Bros Drlg Co	3	dsl	150	3000	4000	B Erie 36-L
		INDIANA				
Gibson County						
Highland Oil Co	1	dsl	—	2000	—	B Erie 24-L
	2	dsl	—	3000	—	B Erie 28-L

Service Directory

STEWART & STEVENSON SERVICE NUMBERS

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TELEPHONE SERVICE AT THIS NUMBER FROM 7 AM TO MID-NIGHT EACH DAY.
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Earl Brown OL 4-9396
Joe Dibello HO 2-1770
Ed Capps OX 7-7928
Lawrence Presley MI 9-1619
Hardy Voth CA 7-7620
Frank Rumsey MI 9-3983
John Sanchez WA 1-2825
J. G. Frank MA 3-3566

SERVICE:
Geo. Moyer MI 9-8902
Hugo Wunderlich HO 5-1094
G. B. Shandley OR 4-2927
Fred Mitchell MI 5-0949

SALES:
C. E. Ames JA 4-9027
E. E. Childress MA 3-2558
H. A. Trotter WA 1-4784
N. J. Herman MO 5-1824
W. E. Powell JA 3-8976
Joe Manning MA 3-8493

IRRIGATION DEPT.:
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LUBBOCK BRANCH PO 2-5260

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SERVICE:
Alvis Ford SH 4-1545

SALES:
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Jim Harbin SW 9-4873
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SALES:
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Jake Conine FE 2-9008
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PARTS:
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SERVICE:
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SALES:
Carsey Manning DA 7-3378
L. L. Howell (Richardson) AD 5-7642
Miles McInnis FL 7-2026

SAN JUAN BRANCH:
Sterling 7-3206

PARTS:
Johnny Wolf ST 7-3452

SERVICE:
Earl Gorhum ST 7-2659

SALES:
A. B. Grant ST 7-3505

TYLER, Representative:
Jesse Ellis 2-1032

LONGVIEW: Industrial Power & Supply Co. (dealer) Plaza 8-5564

PARTS:
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SALES:
Bill Foster PL 8-9626

SERVICE:
John Stoddard PL 3-2088

WICHITA FALLS: Representative
Mike Carter Engine Wks. 2-5229

PARTS:
W. E. Rutledge 7-7534

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SEMCO, Dealer LI 2-3114

PARTS:
C. R. Horn LI 6-6249

SERVICE:
R. E. Spriggs LI 2-2487

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Ed Carney Whitehall 4-3942
GE 4-9281

CLEVELAND: Representative
Irrig. Only Day No. 660
Night Gervis Hall 660

GRAPELAND, TEXAS: Representative, Irrig. Only
Brown Motor Co. 36

ARANSAS PASS, TEXAS: (Parts and Service only)
Kincaid's 556

BEAUMONT, Representative
(Engine Sales & Service) 2-7707
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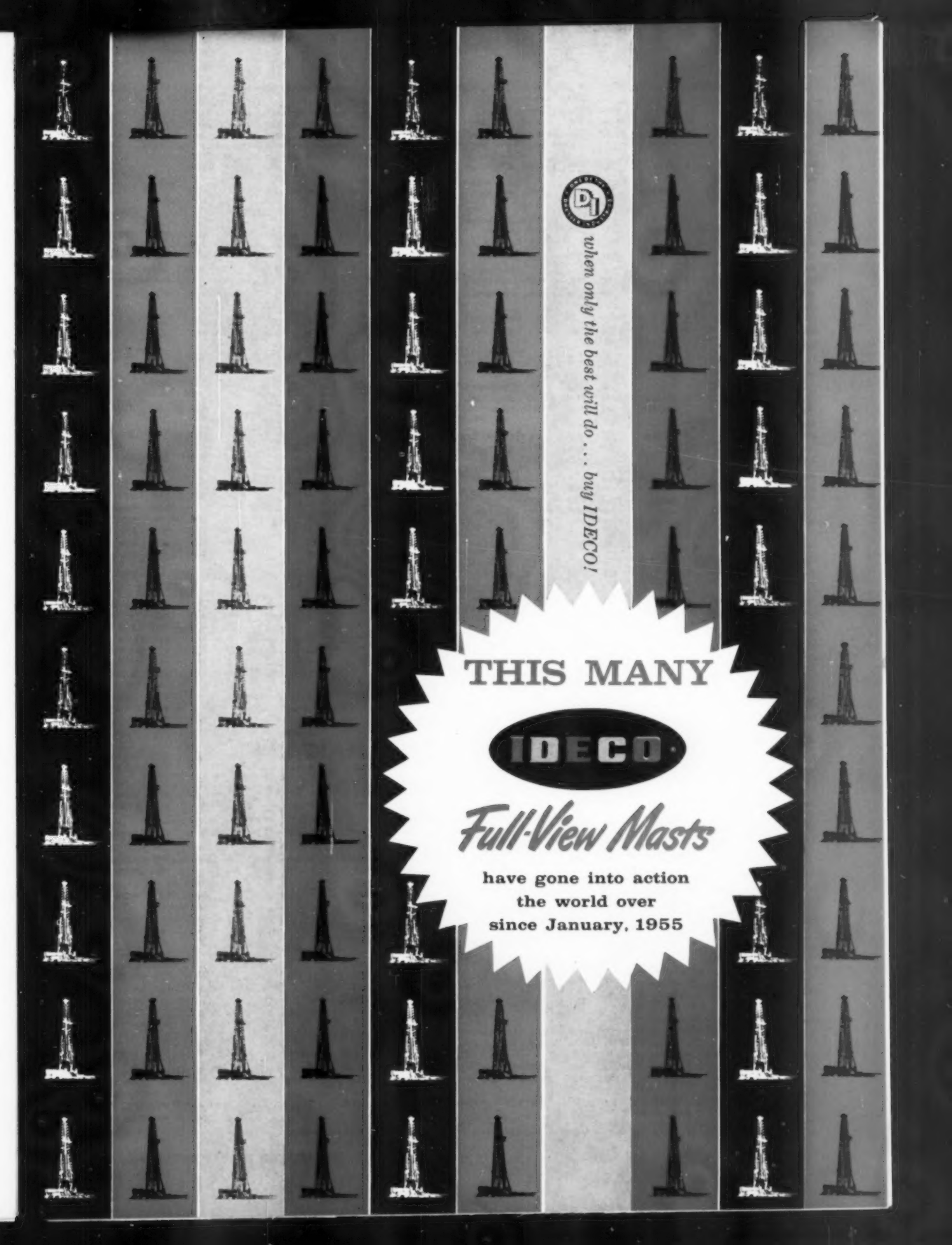
If you have outlying field operations and want extra copies of this page write or phone Stewart & Stevenson Services. The copies will be sent pronto.

STEWART & STEVENSON SERVICES, Inc.
4516 HARRISBURG BLVD., HOUSTON

THE NATION'S LARGEST DISTRIBUTOR OF GM DIESEL ENGINES

Contractor's Name	Rig No.	Type Power	HP of Driving Engine	Top to Bottom Drlg Cap.	Workover and Cleanout Depth Cap.	Rig Make and Model
Princeton Mining Co	1	gas	85	—	3500	Crdwll L
C W Strotman Drlg Co	4	gas	175	3500	4000	B Erie 36-L
Posey County						
Houchins Drlg Co	2	gaso	150	5000	—	Frnks Spddr
KANSAS						
Anderson County						
R L Horn & Sons Drlg Co	1	dsl	60	1600	2000	Star 72
Barber County						
Signal Oilfield Serv	9	dsl	150	—	6000	Crdwll RL
Barton County						
Signal Oilfield Serv	1	dsl	200	—	6000	Crdwll RL
Butler County						
Morrison Drlg Co Inc	4	LPG	90	—	3500	B Erie 36-L
Strait Drlg Inc	1	gas	175	3500	4000	B Erie 36-L
Chautauqua County						
Bennett Drlg Co	10	LPG	—	2000	2500	B Erie 60-L
Mora Drlg Co	7	gas	200	3500	—	Natl T-12
Cowley County						
Carter Drlg Co	1	LPG	145	2000	4500	Wlk-Nr C33
	3	LPG	145	2000	4500	Wlsn Mogul
Elk County						
Butler County Drlg Co	1	dsl	130	3500	5000	Natl 3A-6
Ellis County						
Herbert-Smith Cable Tools	2	gas-prop	145	—	—	Wlkr-Nr
Greenwood County						
Paul Septer Drlg Co	7	btne	—	4500	—	B Erie 36-L
Haskell County						
Graham-Michaelis Drlg Co	3	dsl	150	3500	6000	B Erie 36
Labette County						
Veeder Supply & Dev Co	BE 2	dsl	120	3500	4500	B Erie
Meade County						
Dunnam & Wyant Drlg Co	1	LPG	145	—	8000	Crdwll RL
Graham-Michaelis Drlg Co	1	dsl	175	3000	8000	Crdwll
	2	dsl	175	3000	8000	Crdwll
Russell County						
Shields Oil Producers	2	gas	145	3500	3500	B Erie 48-L
Signal Oilfield Serv	3	gas	145	—	6000	Crdwll RL
Stafford County						
Signal Oilfield Serv	6	dsl	200	—	6000	Crdwll RL
Sumner County						
Carter Drlg Co	2	LPG	145	2000	4500	Wlk-Nr C33
KENTUCKY						
Hopkins County						
Riley & Gammon	1	dsl	60	1200	1800	B Erie 22
	2	gaso	30	600	1000	B Erie 20
MICHIGAN						
Crawford County						
Union Rotary Corp	2	gas-gaso-LPG	120	5000	7000	Crdwll KL
Gladwin County						
Union Rotary Corp	1	gas-gaso-LPG	120	5000	7000	Crdwll KL
Hillsdale County						
McClure Oil Co	3	gas	145	5000	5000	B Erie 36-L
Midland County						
Union Rotary Corp	4	gas-gaso-LPG	150	7500	10,000	Crdwll RL
	6	gas-gaso-LPG	180	7500	10,000	Crdwll RL
Montcalm County						
McClure Oil Co	1	gas	145	5000	5000	B Erie 36-L
	2	gas	145	5000	5000	B Erie 36-L
	4	gas	145	4500	4500	B Erie 36-L
	5	gas	145	4500	4500	B Erie 36-L
Union Rotary Corp	3	gas-gaso-LPG	150	7500	10,000	Crdwll RL
Osceola County						
Gordon Drlg Co	5	gas-LPG	150	4000	5000	Crdwll H
Saginaw County						
Union Rotary Corp	5	gas-gaso-LPG	150	7500	10,000	Crdwll RL
MONTANA						
Blaine County						
M-H-O Drlg Co	6	dsl	140	3000	4500	B Erie 36-L
Dawson County						
Signal Oilfield Serv	10	dsl	225	—	8500	Frnks Clpr
Glacier County						
M-H-O Drlg Co	4	gas-btne	165	3500	5000	B Erie 36-L
	7	dsl	220	6000	8000	B Erie 48-L
Pondera County						
Treasure State Drlg Co	1	gas	140	3500	4500	B Erie 36-L
Teton County						
J W Lawrence	1	gas-gaso	125	3500	—	Natl
	2	gas-gaso	175	5000	—	B Erie
NEBRASKA						
Banner County						
Signal Oilfield Serv	2	dsl	200	—	8000	Crdwll RL
Kimball County						
Signal Oilfield Serv	5	dsl	200	—	8000	Crdwll RL
	11	dsl	—	—	8000	Crdwll RL
Red Willow						
Signal Oilfield Serv	12	dsl	—	—	8000	Crdwll RL
Richardson County						
Nemaha Oil Co	1(wo)	gas	150	—	4500	Wichtex C-60
NEVADA						
Churchill County						
Barry Well Drlg	3	gaso	85	—	500	Custom
NEW MEXICO						
Chaves County						
Keyes Drlg Co	4	LPG	53	1500	2500	B Erie 24-L
Eddy County						
Aldridge & Stroud Inc	8	LPG	145	4500	4500	Wichita 61
	11	LPG	145	6000	6000	Wichita 61
Carper Drlg Co Inc	5-C	gas-LPG	125	4000	4500	B Erie 36-L
Kersey & Company	1	gas-gaso	185	5000	5000	Natl 3
	2	gas-gaso	120	3000	3500	Wich Spddr 55
	3	gas-gaso	120	4000	4500	Wich Spddr 61
	4	gas-gaso	120	4000	4500	Natl 3
Needham Drlg Co	1	dsl	160	5000	—	Wich Spddr 65
S P Yates Drlg Co	3	LPG	150	3500	—	Wichita 55
	4	LPG	130	3000	—	Ft Wrth Spr J
	5	LPG	180	6000	—	Ft Wrth Jumbo J
	6	LPG	180	6000	—	Ft Wrth Jumbo J
Lea County						
Aldridge & Stroud Inc	1	LPG	140	4000	5000	B Erie 36-L
Carper Drlg Co Inc	6-C	gas-LPG	145	6000	7000	Wlkr-Nr S-55
Needham Drlg Co	2	LPG	180	5000	—	Wich Spddr 66
Westlund Drlg Co	6	gas-btne	975	12,000	—	Wlsn Titan
San Juan County						
Signal Oilfield Serv	13	dsl	—	—	8000	Crdwll RL
OHIO						
Hocking County						
R A Cooper Drlg Co	1	gas	—	4000	4000	Natl 12
Wood County						
H J Lininger	2	dsl	175	3500	—	L C Moore
Wyandot County						
H J Lininger	1	gas-gaso	78	2500	—	Beth Cyclone
	3	gas-gaso	65	1800	—	Beth Cyclone
OKLAHOMA						
Beaver County						
Chambless-Rosen Drlg Co	2	gas	145	—	10,000	Crdwll
Beckham County						
G H Ray Well Serv Co	5	gas-gaso	—	12,000	—	Crdwll RL
Bryan County						
Feeney & Meyers	1	LPG-gas-gaso	145	—	10,000	Crdwll RL Spd
Caddo County						
G H Ray Well Serv Co	1	gas-gaso	—	12,000	—	Wlsn Master
	6	gas-gaso	—	12,000	—	Crdwll S-60
	7	gas-gaso	—	4500	—	Wilson
	8	gas-gaso	—	12,000	—	Crdwll
Carter County						
Feeney & Meyers	2	LPG-gas-gaso	145	—	10,000	Crdwll RL Spddr
Creek County						
B & W Drlg Co	2	gas-btne	145	3000	4000	Wlkr-Nr S-43
Bennett Drlg Co	2	LPG	—	3500	4000	Star 45
	3	LPG	—	2750	3250	B Erie 28-L
	8	LPG	—	2750	3250	B Erie 28-L
	9	LPG	—	3500	4500	Wlkr-Nr 34
4-J Drlg & Well Serv Co	1	gaso	—	—	4500	B Erie 36-L
	2	gaso	—	—	3500	Wlkr-Nr
C H Hartman	1	—	—	3500	—	—
M L (Mike) Marrs Drlg Co	1	LPG	145	3500	4500	B Erie 36-L
	2	LPG	145	3500	5000	B Erie 36-L
	3	LPG	145	3500	5000	B Erie 36-L
	4	LPG	145	3500	5000	B Erie 36-L
Garvin County						
Feeney & Meyers	3	LPG-gas-gaso	145	—	10,000	Crdwll RL Spd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THIS MANY
IDECO
Full-View Masts
have gone into action
the world over
since January, 1955

Contractor's Name	Rig No.	Type Power	HP of Driving Engine	Top to Bottom Drlg Cap.	Workover and Cleanout Depth Cap.	Rig Make and Model
Grant County						
Sooner Drlg Co	2	LPG	145	5000	7500	Wlkr-Nr
Hughes County						
Skinner & McDougal Drlg Co	2	gaso-btne	145	4000	5500	Wlkr-Nr
Kay County						
Dave Morgan Drlg Co	—	LPG-gas	14	—	6500	Crdwll RL
Seiboldt Drlg Co	1	gas-btne	165	7000	9000	Wlkr-Nr
Logan County						
Sooner Drlg Co	4	LPG	145	5000	7500	Wlkr-Nr
Muskogee County						
Ralph G Ladd	1	gas-gaso	65	1750	2500	Star Spddr K
RFB Drlg Co	—	btne	100	2500	3500	Cyclone 46
Noble County						
Chambless-Rosen Drlg Co	3	gas	145	—	10,000	Crdwll
Mora Drlg Co	4	gas	300	7000	—	Wisn Giant
Nowata County						
Bennett Drlg Co	6	LPG	—	1750	2250	B Erie 24-L
Okfuskee County						
D & J Drlg Co	—	btne	140	5000	5000	Star Spddr 45
Floyd R Hyer	1	gas-gaso-btne	60	2250	2750	Star K Spddr
Skinner & McDougal Drlg Co	1	gaso-btne	145	4000	6500	Crdwll
Okmulgee County						
B & W Drlg Co	1	gas-btne	140	3000	4000	Wlkr-Nr S-43
Gold-Mar Drlg Co	1	LPG	125	2500	3500	Wich Spddr 25
K R McKinney Drlg Contr	1	LPG	160	2500	3500	B Erie 28-L
Osage County						
Bennett Drlg Co	5	LPG	—	2750	3250	B Erie 28-L
W C Holt Drlg Co Inc	1	gas	—	3000	—	—
Mora Drlg Co	1	dsl	250	5000	—	Wisn Mogul
Signal Oilfield Serv	7	gas	145	—	5000	Wlkr-Nr C-34
	8	gas	145	—	5000	Wlkr-Nr C-34
Tolson Drlg Co	1	dsl	145	4000	—	Wlkr-Nr S-33
Pawnee County						
Bodard Drlg Co	2	gas	225	7000	—	Crdwll R
Payne County						
Chambless-Rosen Drlg Co	4	gas	145	—	10,000	Crdwll
Skinner & McDougal Drlg Co	3	gaso-btne	145	4000	5500	Crdwll
Pontotoc County						
Joe Lawrence Drlg Co	1	gas	160	3500	3800	Crdwll H
Pottawatomie County						
Sooner Drlg Co	6	gas-LPG	145	—	6500	Crdwll RL
Rogers County						
Stephens Drlg Co	1	gas	120	2000	2500	Star 43
Seminole County						
Mora Drlg Co	6	dsl	250	5000	—	Wisn Mogul
Troup & Suttles Inc	1	gas-gaso	145	—	9000	Wlkr-Nr 33
Tulsa County						
Bar-Lee Drlg Co	1	LPG	110	3000	3500	Wlkr-Nr 32
J M Corbett	1	gas	—	5000	6500	Ft Wrth
J M C Drlg Interests	2	gas	—	1500	—	Keystone
Stephens Drlg Co	2	gas	180	3500	4000	Star 45
	3	gas	150	3000	4000	Star 83
Wagoner County						
K F B Drlg Co	—	btne	50	1000	1500	Armstrong 25T
	—	btne	100	2500	3500	Star 45ST
	—	btne	125	4000	5000	Keystone 35
Washington County						
H & S Drlg Co	1	gas	90	3000	—	—
	2	gas	60	2000	—	—
	3	gas	140	4000	—	B Erie 36-L
R W Uhl	1	gas-gaso	—	2500	3000	B Erie 28-L
PENNSYLVANIA						
Berks County						
C S Garber & Sons Inc	32	gas-gaso	32	1500	—	—
	33	gas-gaso	32	1500	—	—
Bucks County						
C S Garber & Sons Inc	31	gas-gaso	32	1500	—	—
Clearfield County						
Fairman Drlg Co	1	dsl	225	7500	8000	B Erie Spdr 48-L
	5	dsl	170	5000	6000	B Erie Spdr 36-L
Indiana County						
Fairman Drlg Co	3	gas	225	7500	8000	B Erie Spdr 48-L
	4	gas	225	7500	8000	B Erie Spdr 48-L
Jefferson County						
Fairman Drlg Co	2	dsl	225	7500	8000	B Erie Spdr 48-L
Lancaster County						
C S Garber & Sons Inc	29	gas-gaso	32	1500	—	—
	34	gas-gaso	32	1500	—	—
Philadelphia County						
C S Garber & Sons Inc	30	gas-gaso	32	1500	—	—
TEXAS						
Andrews County						
Westlund Drlg Co	1	gas-btne	600	6500	600	Unit U-15
	5	gas-btne	650	7500	—	Natl 50
Carson County						
C P Drlg Co	6	gas-btne	125	3500	4000	Wisn Mogul
Cochran County						
Western Drlg Co Inc	3	btne	145	—	—	B Erie 36-L
Coleman County						
W H McGarr Ind	1	gas-LPG	120	4500	4500	Wich 61
	2	gas-LPG	100	2500	2500	Ft Wrth SprD
Cooke County						
Russell & Russell Drlg & Prod	1	gaso	80	2500	2500	Ft Wrth Spr H
Comanche County						
Kent & Preston	2	btne	120	4000	4000	Ft Wrth Jumbo
Crane County						
Aldridge & Stroud Inc	9	LPG	—	6000	6000	Ft Wrth J
Crockett County						
Aldridge & Stroud Inc	4	LPG	—	2500	2500	Ft Wrth D
Brown & Thorp Drlg Co	3	LPG	180	4000	—	Ft Wrth F-37
Buck Jones Drlg Co	1	btne	140	4000	4000	Wlkr-Nr 32
Ector County						
Aldridge & Stroud Inc	2	LPG	525	2500	5000	B Erie 36-L
	5	LPG	—	3000	3000	B Erie 28-L
Carey & Parker Inc	2	gas-gaso-btne	—	—	10,000	Crdwll RL
	4	gas-gaso-btne	—	—	10,000	Crdwll RL
Eastland Oil Co	6	gas	125	4500	6000	B Erie
McQueen & Stout Drlg Co	16	LPG	185	5000	5000	Crdwll RL
	18	LPG	145	5000	—	Natl 3
Erath County						
Louis Pitcock Drlg Co	1	dsl	225	6000	7000	Wich 66
Gray County						
C P Drlg Co	8	gas-btne	125	3500	4000	B Erie 36-L
C F Hills Drlg Co	2	gas-btne	145	5000	9000	Wlkr-Nr S-33
	3	gas-btne	145	6000	7800	Wlkr-Nr C-34
I J Huval Well Serv Co	1	gas-gaso-LPG	145	4000	10,000	Wisn Mogul Spdr
	2	gas-gaso-LPG	145	4000	10,000	Wisn Mogul Spdr
Murphy & McKernan	1	gas-gaso	145	4500	5500	B Erie 36-L
	2	gas-gaso	145	4500	5500	B Erie 36-L
Howard County						
Carey & Parker Inc	1	gas-gaso-btne	—	—	4000	Clark 71
	5	gas-gaso-btne	—	—	9000	Crdwll RL
C D Turner Drlg Co	1	btne	145	3500	8000	Wlkr-Nr C-37
	2	btne	140	2500	5000	Wlkr-Nr C-32
Hudspeth County						
Buck Jones Drlg Co	2	btne	100	2500	2500	Wlkr-Nr 32
Western Drlg Co Inc	8	btne	185	—	—	B Erie 48-L
Hutchinson County						
Graham-Michaelis Drlg Co	4	dsl	175	—	4000	Crdwll KL
Robinson Bros Drlg Co	1	gas	200	4500	5000	B Erie 48-L
Irion County						
James Smith Drlg Contr	1	gaso-LPG	145	3500	4500	B Erie Spdr 36-L
Jack County						
E & H Drlg Co	2	gas-btne	225	4500	6000	Unit U-34
Ramey Well Service	1	LPG	140	—	8000	Wichtex E-75
Jones County						
Jones Well Serv Co	3	gas-gaso	175	3500	6000	B Erie 36-L
Kerr County						
Saunders Drlg Inc	1	LPG	70	2500	3000	B Erie 28-L
Lubbock County						
Western Drlg Co Inc	10	btne	185	—	—	B Erie 48-L
McCulloch County						
Kent & Preston	1	dsl	160	6000	—	Ft Wrth J-37
Mitchell County						
Willard Gladson & Odstrcil Bros Drlg Co	3	btne	—	—	—	B Erie 36-L
Nolan County						
Jones Well Serv Co	2	gas-gaso	175	3500	6000	B Erie 36-L
Oxford & Stasney Drlg Co	1	dsl	530	7500	10,000	Wisn Giant
Pecos County						
R L Bob Clark Drlg Contr	3	LPG	130	3500	4500	B Erie
Reagan County						
Westlund Drlg Co	3	gas-btne	600	6500	—	Unit U-15
	7	gas-btne	650	7500	—	Wisn Roadrr

Contractor's Name	Rig No.	Type Power	HP of Driving Engine	Top to Bottom Drlg Cap.	Workover and Cleanout Depth Cap.	Rig Make and Model
Wilbanks & Rutter Drlg Co	2	gas	—	—	—	—
Reeves County						
Ford Chapman Drlg Contr	1	LPG	120	4500	5500	B Erie 36-L
Scurry County						
Jones Well Serv Co	1	gas-gaso	175	3500	6000	B Erie 36-L
Western Drlg Co Inc	5	btne	185	—	—	B Erie 48-L
Willard Gladson & Odstrcil Bros Drlg Co	1	btne	—	—	—	B Erie 28-L
	2	btne	—	—	—	B Erie 36-L
Shackelford County						
J Conley Miles Drlg Co	1	btne	80	1750	2500	B Erie 24-L
	1	btne	114	2500	3500	Ft Wrth D
	2	btne	100	1750	2500	B Erie 24-L
Oxford & Stasney Drlg Co	3	dsl	265	5000	7500	Brwstr N-4
W H Varner Drlg Co	1	gaso	75	1500	—	B Erie 22-W
	1	btne	150	—	—	Wisn Spr
Sherman County						
C P Drlg Co	3	gas-btne	125	3500	4000	B Erie 36-L
Stephens County						
E & H Drlg Co	1	gas-btne	550	7500	10,000	Unit U-15
Taylor County						
West Central Drlg Co	2	gas-gaso	—	—	—	Ft Wrth J
Throckmorton County						
Jack L Story	S-1	dsl	100	8000	9000	Wlk-Nr C37
Upton County						
Brown & Thorp Drlg Co	2	LPG	135	5500	—	Wichita 66
	4	LPG	135	4000	—	Ft Wrth F
	5	LPG	135	4000	—	Ft Wrth D
	6	LPG	180	4000	—	Ft Wrth F
	7	LPG	135	4500	—	Wichita 61
	8	LPG	135	3500	—	Ft Wrth D
	9	LPG	135	3500	—	Ft Wrth D
	10	LPG	135	3500	—	Wichita 55
	11	LPG	135	3500	—	Ft Wrth D
Buck Jones Drlg Co	3	btne	150	5000	5000	Natl 3
McQueen & Stout Drlg Co	20	LPG	185	5000	5000	Crdwll RL
Ward County						
Aldridge & Stroud Inc	7	LPG	145	—	8500	Crdwll RL
Hatfield Drlg Co Inc	1	dsl	165	8500	10,000	Crdwll
	2	gas	120	5000	7500	Crdwll
	3	gas	145	8500	10,000	Crdwll
Hissom Drlg Co	5	gas	180	7500	10,000	Crdwll RL
J E B Drlg Co	1	gas-gaso-btne	145	5000	6500	Wlkr-Nr S-33
C C Pollard	—	gas	150	4000	5000	Wich 61 Spddr
	—	dsl	150	5000	6000	Wich 66 Spddr
Wheeler County						
Wagner & Wyant Drlg Co Inc	1	btne	145	3000	4500	Wlkr-Nr S-33
Wichita County						
Lin-Mour Drlg Co	2	gas	125	—	6500	Wlkr-Nr C-34
Ramey Well Service	2	LPG	140	—	8000	Wichtex E-75
Wilbarger County						
Ayers & Burch	1	btne	100	1500	—	Wlkr-Nr
Dublin-Kiel	2	LPG	140	2000	3000	Wlkr-Nr S-37
Frank T Wolfe	1	btne	100	—	2500	Ft Wrth D
Winkler County						
Bolin Oil Co & D H Bolin	8	gas	145	4500	—	Wlkr-Nr S-45
R L Bob Clark Drlg Contr	1	LPG	110	3500	4500	B Erie
	2	LPG	90	3500	4500	B Erie
Donnell Drlg Co	1	gas-btne	—	5000	5000	Wichita 61
	2	gas-btne	—	5000	5000	Wichita 61
	3	gas-btne	—	5000	5000	Wichita 55
Yoakum County						
Western Drlg Co Inc	2	btne	145	—	—	B Erie 36-L
	4	btne	185	—	—	B Erie 48-L
Young County						
Oney Drlg Co	1	gas	165	5500	—	Wichita
	2	gas	145	5500	—	Wichita
	3	gas	210	6500	—	Wichita
	4	gas	145	5500	—	Ft Wrth
UTAH						
Uintah County						
Charles M Jameson	1	gas-gaso	—	—	—	B Erie 36-L
WEST VIRGINIA						
Logan County						
Allen Drlg Co	3	gas	128	5000	6000	B Erie Spdr 36-L
	6	gas	145	5000	6000	B Erie
Mingo County						
Allen Drlg Co	1	gas	128	5000	6000	B Erie Spdr 36-L
	2	gas	145	5000	6000	B Erie Spdr 36-L
	4	gas	128	5000	6000	B Erie Spdr 36-L
	5	gas	145	5000	6000	B Erie Spdr 36-L
Raleigh County						
Allen Drlg Co	7	gas	175	3500	5000	Natl Mach 2
Wetzel County						
Cecil Chister & Son	1	gas-gaso	78	3500	3500	B Erie Spdr 28 L
WYOMING						
Weston County						
Perl Smith Drlg Contr	1	gaso	145	5000	8000	Crdwll

CANADIAN DRILLING CONTRACTORS

ROTARY AND CABLE TOOL

ALPHABETICAL LISTING

Anderberg & Sons Drlg Ltd
8 Hatfield Ct
Calgary Alberta Canada

Arrow Drlg Co
201 Oil Exchange Bldg
Calgary Alberta Canada

Peter Bawden Drlg Ltd
810-A First St
Calgary Alberta Canada

Bennett & Hurst Drlg Co Ltd
1315 First St
Calgary Alberta Canada

Big Horn Drlg Ltd
6530 100 St
Edmonton Alberta Canada

Brinkerhoff Drlg Co Ltd
1001 Mobil Oil Bldg
Calgary Alberta Canada

Cactus Drlg Corp of Tex
Box 32
Midland Tex

Can American Drlg Ltd
133 Sixth Ave E
Calgary Alberta Canada

Cardinal Drlg Co
420 Fourth St
Bismark N D

Cascade Drlg Co Ltd
330 9th Avenue West
Calgary Alberta Canada

Central Leduc Drlg Co Ltd
224 9th Ave W
Calgary Alberta Canada

Commonwealth Drlg Co Ltd
122 8th Ave W
Calgary Alberta Canada

Dallas Drlg Co Ltd
1208 First Natl Bk Bldg
Dallas Tex

Devon Drlg Co Ltd
703 5th St W
Calgary Alberta Canada

Dominion Drlg Co Ltd
401 Petroleum Bldg
Edmonton Alberta Cnada

Double A Drlg Co Ltd
709 8th Ave W
Calgary Alberta Canada

Duke Drlg Co Ltd
121 8th Ave W
Calgary Alberta Canada

General Petroleums of Canada Ltd
224 Ninth Ave W
Calgary Alberta Canada

Gustavson Drlg Co Ltd
208 Alberta Block
Calgary Alberta Canada

Hi-Tower Drlg Co Ltd
400 Lancaster Bldg
Calgary Alberta Canada

Hunter Drlg Ltd
602 7th Ave W
Calgary Alberta Canada

Kenyon's Drlg Serv Co Ltd
10439 82nd Ave
Edmonton Alberta Canada

Loffland Bros Co
Box 1649
Tulsa Okla

Lohmann-Johnson Drlg Co Ltd
208 Bamlett Bldg
Calgary Alberta Canada

Moore Drlg Co Ltd
6th Floor Petroleum Bldg
Calgary Alberta Canada

Parker Drlg Co of Canada Ltd
409 8th Ave W
Calgary Alberta Canada

Pennant Drlg Ltd
108-A 8th Ave W
Calgary Alberta Canada

Precision Drlg Co Ltd
1134 8th Ave W
Calgary Alberta Canada

Reading & Bates Drlg Co Ltd
Royal Bk Bldg
Calgary Alberta Canada

Regent Drlg Co Ltd
Box 421
Edmonton Alberta Canada

S & T Drlg Co Ltd
10824-A 82nd St
Edmonton Alberta Canada

St Eustache Well Drlrs
2204 Oka Rd
St Eustache sur le Lac
Quebec Canada

Signal Expl Inc
203 Mayo Bldg
Tulsa Okla

Stewart Drlg Co Ltd
10856 82nd Ave
Edmonton Alberta Canada

Thornton & Bates Drlg Co
Royal Bk Bldg
Calgary Alberta Canada

Trident Drlg Co Ltd
830 8th St W
Calgary Alberta Canada

Trinity Canadian Drlg Co
1001 F R Webster Bldg
237 7th Ave W
Calgary Alberta Canada

Tri-Province Drlg Co Ltd
307 6th Ave W
Calgary Alberta Canada

Union Rotary Drlrs (Canada) Ltd
155 Wellington St
Sarnia Ontario Canada

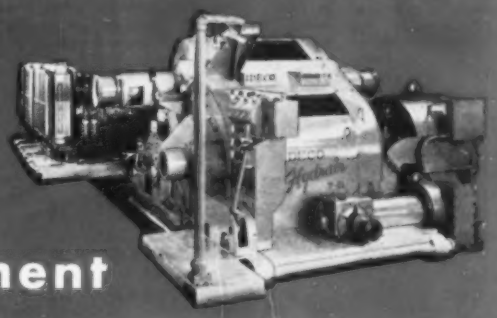
Wilrich Petroleums Ltd
10584 107th St
Edmonton Alberta Canada

Canadian Contract ROTARY Drilling Rigs

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
ALBERTA PROVINCE						
Loffland Bros Co	C-1	dsl	740	—	900	11,000
	C-2	dsl	600	—	600	9,000
	C-3	dsl	970	—	1275	14,000
	C-4	dsl	1000	—	1275	15,000
	C-5	dsl	1570	—	1275	14,000
	C-6	dsl	1200	—	1200	16,000
Athabasca						
Moore Drlg Co Ltd	2	dsl	600	Emsco 450	640	7,000
Barons						
Devon Drlg Co Ltd	3	dsl	700	Emsco GB-500	500	9,500
Bashaw						
Commonwealth Drlg Co Ltd	7	dsl	750	Natl 50	530	6,500
Bentley						
Commonwealth Drlg Co Ltd	3	dsl	690	Natl 50	600	6,500
Big Valley						
Parker Drlg Co of Canada Ltd	8	dsl	400	Natl 50	500	6,500
Bindloss						
General Pet of Canada Ltd	21	dsl	250	Natl T-20	185	4,000
Bohn Lake						
Wilrich Drlg Ltd	4	dsl	110	Failing 2500	110	3,000/3½"
Bragg Creek						
General Pet of Canada Ltd	18	dsl	1400	Natl 80-B	1150	10,000
Breton						
Arrow Drlg Co	8	dsl	250	Emsco GB-350	350	7,000
	19	dsl	250	Emsco GB-350	350	7,000
Buck Creek						
Commonwealth Drlg Co Ltd	10	dsl	440	Crdwll O	480	6,000
	16	dsl	560	Emsco GB-350	450	6,500
Duke Drlg Co Ltd	2	dsl	650	Natl 50	650	8,000
Hi-Tower Drlg Co Ltd	7	dsl	525	Oilwell 66	550	8,000
	8	dsl	570	Unit U-15	600	8,000
Parker Drlg Co of Canada Ltd	4	dsl	400	Natl 50	500	6,500
Cadotte Lake						
Commonwealth Drlg Co Ltd	11	dsl	260	Ideco H-40	300	5,500
Calgary						
Anderberg & Sons Drlg Ltd	1	gaso	—	Mayhew 1000	—	1,000/2½"
Calmar						
S & T Drlg Co Ltd	3	dsl	900	Natl 55	900	9,000
Cardston						
Brinkerhoff Drlg Co Ltd	21	dsl	850	Emsco GB-800	1269	13,500
General Pet of Canada Ltd	17	dsl	1400	Natl 55	1050	7,000
Carmangay						
Brinkerhoff Drlg Co Ltd	2	dsl	370	Natl 50-A	600	8,000
Claresholm						
Commonwealth Drlg Co Ltd	23	dsl	865	Emsco GC-500	800	8,500
Coleman						
Cascade Drlg Co Ltd	14	dsl	—	Unit U-20	—	14,000
Cooking Lake						
Brinkerhoff Drlg Co Ltd	10	dsl	200	Natl T-32	300	6,000
Cynthia						
Cascade Drlg Co Ltd	5	dsl	—	Natl 50-A	—	7,500
	7	dsl	—	Natl 50-A	—	8,000

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Didsbury						
Stewart Drlg Co Ltd	1	dsl	—	Unit U-15	—	7,500
Drayton Valley						
Gustavson Drlg Co Ltd	1	dsl	500	Natl 50	500	7,500
Hi-Tower Drlg Co Ltd	1	dsl	525	Oilwell 66	550	8,000
Reading & Bates Drlg Co Ltd	6	dsl	375	Natl 50	675	7,000
S & T Drlg Co Ltd	1	dsl	520	Natl 50-A	520	8,000
	2	dsl	440	Natl T-32	270	6,000
Thornton & Bates Drlg Co	5	dsl	375	Natl 50-A	600	7,000
Edson						
Arrow Drlg Co	21	dsl	600	Emsco J-1250	1400	14,000
Regent Drlg Co Ltd	25	dsl	750	Brwstr N-75	780	10,000
Trident Drlg Co Ltd	8	dsl	—	Oilwell 96	1920	15,000
	13	dsl	—	Oilwell 66	640	7,000
Elkton						
Trident Drlg Co Ltd	9	dsl	—	Oilwell 76	960	10,000
Entrance						
Gustavson Drlg Co Ltd	4	dsl	850	Natl 55	850	10,000
Trident Drlg Co Ltd	12	dsl	—	Unit U-15	640	7,500
Erskine						
Gustavson Drlg Co Ltd	3	dsl	275	Ideco H-40	300	6,000
Falher						
Gustavson Drlg Co Ltd	5	dsl	420	Natl T-32	275	6,500
Faust						
Precision Drlg Co Ltd	8	dsl	276	Ideco H-30	276	5,000
Flatbush						
Brinkerhoff Drlg Co Ltd	20	dsl	370	Natl 50-A	450	8,500
Fort Assiniboine						
Commonwealth Drlg Co Ltd	17	dsl	400	Emsco GB-350	465	6,000
Gilby						
Pennant Drlg Ltd	4	dsl	590	Crdwll O	650	9,500
Grande Prairie						
Parker Drlg Co of Canada Ltd	3	dsl	765	Oilwell 76	1005	10,000
Regent Drlg Co Ltd	26	dsl	260	Ideco H-40	260	6,000
Trident Drlg Co Ltd	10	dsl	—	Emsco GB-350	510	6,500
Hanna						
Tri-Province Drlg Co Ltd	4	dsl	520	Emsco GA-350	520	6,000
Harmatton						
Commonwealth Drlg Co Ltd	26	dsl	1275	Natl 80-B	1410	12,000
Moore Drlg Co Ltd	1	dsl	1000	Unit U-40	1000	10,000
Pennant Drlg Ltd	2	dsl	755	Unit U-15	550	8,500
High River						
Trident Drlg Co Ltd	4	dsl	—	Natl 100	1200	13,000
Hughenden						
Kenyon's Drlg & Serv Ltd	11	dsl	—	Crdwll 151	—	5,000/3½"
Hussar						
Hi-Tower Drlg Co Ltd	9	dsl	285	Crdwll D	300	5,000
Indus						
Duke Drlg Co Ltd	8	dsl	500	Unit U-40	670	10,000
Joffre						
Trident Drlg Co Ltd	3	dsl	—	Oilwell 648	640	5,000
Keg River						
Trident Drlg Co Ltd	14	dsl	—	Oilwell 76	960	10,000

J&L SERVICE
makes IDECO Rigs a blue chip investment



DEPTH RATINGS (FEET) WITH 4½" DRILL PIPE

RIGS for every job

20,000 Get your J&L store on the telephone for information about new IDECO rigs — 2500 Series in electric, torque converter, mechanical, with 2500 HP input.

16,000 1350-S AIR-FLO; 1600-2400 HP input; torque converter drive.

15,000 PR-1350 AIR-FLO POWER RIG; 1500 HP input; mechanical or fluid coupling drive.

14,000 PR-1050 POWER RIG; 1400 HP input; mechanical or fluid coupling drive.

12,000 SUPER 7-11; 1250 HP input; torque converter, fluid coupling, or mechanical drive.

10,500 H-7-11 HYDRAIR; 700-1050 HP input; torque converter drive.

8,000 M-750 mechanical drive; H-750 torque converter drive; 750 HP input.

7,000 H-525 HYDRAIR; 600 HP input; torque converter drive.

6,000 H-40 HYDRAIR; 400 HP input; torque converter drive; skid mounted, or trailer mounted as a Rambler rig.

5,000 H-35 HYDRAIR; 350 HP input; torque converter drive; skid mounted, or trailer mounted as a Rambler rig.

4,500 H-30 HYDRAIR; 300 HP input; torque converter drive; skid, truck, or trailer mounted. Servicing depths to 10,000'.

3,300 H-25 HYDRAIR; 230 HP input; torque converter drive; skid, truck, or trailer mounted. Servicing depths to 9,000'.

2,500 H-20 HYDRAIR; 200 HP input; torque converter drive; skid mounted, or trailer mounted as a Rambler rig. Servicing depths to 7,500 .

PARTS for every rig

An IDECO rig is more than a highly functional piece of rugged equipment.

It's a blue chip investment guaranteed practical by J&L parts service, finest in the United States and Canada.

When you move in with an IDECO, parts are ready. Regularly expendable parts are available at all J&L stores in active drilling areas. Major parts are stocked by J&L stores at these points:

Casper, Wyoming
Great Bend, Kansas
Oklahoma City, Oklahoma
Shreveport, Louisiana
Corpus Christi, Texas
Odessa, Texas
Wichita Falls, Texas
Natchez, Mississippi
Houma, Louisiana
Hobbs, New Mexico
Edmonton, Canada

Jones & Laughlin
SUPPLY DIVISION – Tulsa
SERVING THE UNITED STATES AND CAN

ALL IDECO RIGS have air controls and air clutches — fast, smooth, flexible. The torque converter on Hydrair hoists provides infinitely variable speed with high torque multiplication. Exactly the power you need is always there without throttling, clutching, declutching. Call any J&L Supply number for IDECO Catalog giving detailed descriptions, specifications, performance characteristics of the world's most wanted rigs.

13-M

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Keniese						
Hi-Tower Drlg Co Ltd	6	dsl	755	Oilwell 76	800	12,000
Lac La Biche						
Peter Bawden Drlg Ltd	5	dsl	440	Natl T-32	270	5,500
Brinkerhoff Drlg Co Ltd	15	dsl	370	Natl 50-A	450	8,500
Trident Drlg Co Ltd	5	dsl	—	Emsco 350A	540	6,000
Leduc						
Wilrich Drlg Ltd	2	dsl	120	Natl T-12	160	3,500/3½"
Livock River						
Wilrich Drlg Ltd	6	dsl	300	Unit U-34	300	6,000
MacLeod						
Duke Drlg Co Ltd	6	dsl	850	Unit U-20	1386	13,500
Morinville						
Regent Drlg Co Ltd	28	dsl	500	Natl 50-A	520	7,000
Nampa						
Hi-Tower Drlg Co Ltd	4	dsl	350	Natl 50	450	6,500
Nanton						
Brinkerhoff Drlg Co Ltd	8	dsl	900	Natl 125	1300	15,000
Reading & Bates Drlg Co Ltd	8	dsl	1500	Natl 110	1950	13,500
Nordegg						
General Pet of Canada Ltd	7	dsl	1400	Natl 80-B	1300	13,000
Normandville						
Commonwealth Drlg Co Ltd	19	dsl	735	Natl 50-A	790	8,000
Panther River						
Commonwealth Drlg Co Ltd	27	dsl	870	Natl 50-A	660	8,000
Peace River						
Peter Bawden Drlg Ltd	1	dsl	415	Natl T-32	275	5,500
Lohmann-Johnson Drlg Co Ltd	2	dsl	218	Unit U-15	500	8,500
Parker Drlg Co of Canada Ltd	10	dsl	400	Natl 50-A	500	7,000
Regent Drlg Co Ltd	9	dsl	750	Brwstr N-75	780	10,000
Pembina						
Brinkerhoff Drlg Co Ltd	16	dsl	370	Emsco GA-350	450	7,500
Cascade Drlg Co Ltd	1	dsl	—	Natl 50	—	6,500
	3	dsl	—	Wisn Giant	—	5,500
	4	dsl	—	Natl 50-A	—	7,500
	8	dsl	—	Natl 50	—	6,500
	9	dsl	—	Natl T-32	—	5,500
	10	dsl	—	Natl 50	—	6,000
	15	dsl	—	Oilwell 64B	—	6,000
Dominion Drlg Co Ltd	2	dsl	580	Natl 50-A	450	6,500
	3	dsl	600	Natl T-32	320	5,000
Double-A Drlg Co Ltd	2	dsl	800	Ideco H-525	600	8,000
General Pet of Canada Ltd	3	dsl	425	Natl 50-A	650	7,000
	6	dsl	400	Natl 50-A	500	7,000
	14	dsl	350	Crdwll OA	500	6,500
Hi-Tower Drlg Co Ltd	5	dsl	350	Natl 50	450	5,000
Regent Drlg Co Ltd	3	dsl	720	Brwstr N-7	520	8,000
Trident Drlg Co Ltd	1	dsl	—	Oilwell 64B	640	5,000
	2	dsl	—	Oilwell 64B	640	5,000
Tri-Province Drlg Co Ltd	2	dsl	520	Beth Twstr S-55	520	7,500
	6	dsl	520	Ideco H-525	520	7,500
Petitot River						
Brinkerhoff Drlg Co Ltd	1	dsl	625	Emsco GC-500	846	10,000
	14	dsl	370	Emsco GB-500	600	8,500
Pincher Creek						
Brinkerhoff Drlg Co Ltd	19	dsl	850	Emsco A-800	1269	14,000
	22	dsl	900	Natl 110	1450	15,000
General Pet of Canada Ltd	11	dsl	1400	Natl 80-B	1150	10,000
Quaich Creek						
General Pet of Canada Ltd	16	dsl	1050	Natl 55	1150	6,500
Red Deer						
Peter Bawden Drlg Ltd	6	dsl	722	Unit U-36A	722	8,500
Lohmann-Johnson Drlg Co Ltd	1	dsl	550	Oilwell 66	550	7,500
Red Earth						
Dominion Drlg Co Ltd	1	dsl	360	Natl T-32	280	5,000
	4	dsl	600	Emsco GB-250	300	5,000
Rimbey						
Commonwealth Drlg Co Ltd	8	dsl	690	Brwstr N-7	600	8,000
Hi-Tower Drlg Co Ltd	3	dsl	525	Oilwell 66	550	8,000
Rocky Mountain House						
Commonwealth Drlg Co Ltd	21	dsl	1250	Ideco 7-11	900	10,500
General Pet of Canada Ltd	4	dsl	500	Natl 50-A	650	7,000
Trident Drlg Co Ltd	7	dsl	—	Oilwell 76	960	10,000
Silver Creek						
Reading & Bates Drlg Co Ltd	4	dsl	950	Natl 80-B	1050	12,000
Sedgewick						
Big Horn Drlg Ltd	1	dsl	300	Crdwll S-350	250	5,000
Regent Drlg Co Ltd	2	dsl	260	Brwstr N-4	260	6,000
Slave Lake						
Can American Drlg Ltd	4	dsl	260	Natl T-20	445	4,000
Stettler						
Arrow Drlg Co	6	dsl	250	Emsco GB-350	350	7,000
Parker Drlg Co of Canada Ltd	11	dsl	400	Natl 50	500	6,500
Regent Drlg Co Ltd	30	dsl	260	Ideco H-40	260	6,000
Sturgeon Lake						
Commonwealth Drlg Co Ltd	9	dsl	1020	Ideco 700	940	10,000
Parker Drlg Co of Canada Ltd	1	dsl	615	Oilwell 76	750	10,000
	2	dsl	615	Oilwell 76	750	10,000
Sundre						
Brinkerhoff Drlg Co Ltd	18	dsl	625	Emsco GC-500	846	10,000
Commonwealth Drlg Co Ltd	28	dsl	920	Natl 55	1000	10,000
General Pet of Canada Ltd	10	dsl	1400	Natl 80	1000	12,000
	15	dsl	1400	Natl 55	1050	10,000
Hi-Tower Drlg Co Ltd	10	dsl	755	Oilwell 76	800	12,000
Parker Drlg Co of Canada Ltd	9	—	765	Natl 125	1005	12,000
	12	dsl	600	Oilwell 66	670	8,500
Reading & Bates Drlg Co Ltd	3	dsl	950	Natl 75	1050	10,000
Regent Drlg Co Ltd	6	dsl	750	Brwstr N-75	780	10,000
	7	dsl	1200	Natl 125	1500	17,000
Triangle						
General Pet of Canada Ltd	5	dsl	800	Natl 75	1000	10,000
Upper Hay River						
Moore Drlg Co Ltd	5	dsl	380	Crdwll EC	380	6,000
Utakoma River						
Pennant Drlg Ltd	6	dsl	850	Brwstr N-7	700	9,500
Valleyview						
Peter Bawden Drlg Ltd	2	dsl	750	Natl 55	750	8,500
Waterton Lake						
Commonwealth Drlg Co Ltd	1	dsl	1350	Natl 110	1500	14,000
Westward Ho						
Tri-Province Drlg Co Ltd	1	dsl	1000	Unit U-40	850	11,000
Whitecourt						
Cascade Drlg Co Ltd	2	dsl	—	Wisn Roadair	—	9,200
	12	dsl	—	Natl 80-B	—	14,000
Duke Drlg Co Ltd	7	dsl	850	Unit U-20	1386	13,500
	9	dsl	500	Unit U-15	650	8,500
Pennant Drlg Ltd	1	dsl	755	Unit U-15	675	8,500
Regent Drlg Co Ltd	8	dsl	750	Brwstr N-75	780	10,000
Trinity Canadian Drlg Co	4	dsl	995	Natl 80-B	990	12,000
Tri-Province Drlg Co Ltd	5	dsl	780	Beth Twstr S-55	520	7,500
BRITISH COLUMBIA PROVINCE						
Dallas Drlg Co Ltd	1	dsl	578	Emsco GB-500	500	8,000
	2	dsl	578	Emsco GB-500	500	8,000
	3	dsl	500	Emsco GB-530	520	6,500
	4	dsl	500	Emsco GB-250	320	5,000
Alcan Highway—Mile 195						
Reading & Bates Drlg Co Ltd	7	dsl	375	Natl 50-A	600	7,000
Beaton River						
Arrow Drlg Co	26	dsl	600	Emsco GB-800	1200	13,000
Buck Creek						
Commonwealth Drlg Co Ltd	22	dsl	750	Natl 50	530	6,500
Conroy Creek						
Commonwealth Drlg Co Ltd	20	dsl	1040	Ideco 7-11	900	10,500
Dawson Creek						
Can American Drlg Ltd	3	dsl	750	Natl 80-B	1645	10,000
Reading & Bates Drlg Co Ltd	2	dsl	800	Natl 100	1050	12,000
Trinity Canadian Drlg Co	1	dsl	995	Emsco GC-500	770	10,000
	3	dsl	720	Emsco 350	670	7,000
	5	dsl	1250	Emsco A-800	1150	15,000
	7	dsl	875	Emsco GC-500	720	10,000
Ft. St. John						
Arrow Drlg Co	4	dsl	250	Emsco SB-350	500	7,000
Commonwealth Drlg Co Ltd	15	dsl	800	Brwstr N-7	600	8,000
Devon Drlg Co Ltd	1	dsl	700	Emsco GA-500	500	9,500
	2	dsl	1050	Emsco GA-350	350	7,500
Dominion Drlg Co Ltd	5	dsl	800	Emsco G-500	900	9,000
Moore Drlg Co Ltd	6	dsl	250	Emsco 300	300	6,000
Parker Drlg Co of Canada Ltd	6	dsl	420	Oilwell 52-T	420	6,500
	7	dsl	600	Natl 55	670	9,000
Pennant Drlg Ltd	3	dsl	600	Crdwll O	540	7,500
Regent Drlg Co Ltd	5	dsl	720	Brwstr N-7	520	8,000
	24	dsl	720	Brwstr N-7	520	8,000
Trident Drlg Co Ltd	6	dsl	—	Emsco 500	640	8,500
MANITOBA PROVINCE						
Belmont						
Cascade Drlg Co Ltd	16	dsl	250	Unit U-34	250	4,500

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
Scallion						
Commonwealth Drlg Co Ltd	18	dsl	160	Crdwll RL	170	4,500
Virden						
Peter Bawden Drlg Ltd	4	dsl	220	Crdwll RL	205	4,500
Can American Drlg Ltd	6	dsl	275	Natl T-12	353	3,000
Hunter Drlg Ltd	2	dsl	275	Crdwll	260	6,000
Moore Drlg Co Ltd	3	dsl	320	Brwstr N-4	190	4,000
	4	dsl	330	Frnks 4000	180	3,500
NORTHWEST TERRITORIES PROVINCE						
Arrow Drlg Co	7	dsl	600	Emsco GC-500	700	9,000
ONTARIO PROVINCE						
Lambton						
Union Rotary Drls (Can) Ltd	1	gas-LPG	200	Natl 40	180	4,000
SASKATCHEWAN PROVINCE						
Cactus Drlg Corp of Tex	2	gas-btne	675	Unit U-15	675	8,500
	11	gas-btne	450	Brwstr N-55	450	7,000
Gustavson Drlg Co Ltd	2	dsl	500	Natl T-32	250	6,200
Signal Exploration Inc	1	dsl	500	Unit U-15	625	8,000
	2	dsl	370	Unit U-36-A	420	7,500
	3	dsl	370	Unit U-36-A	420	7,500
Alida						
Can American Drlg Ltd	1	dsl	350	Natl T-32	520	5,000
Precision Drlg Co Ltd	1	dsl	276	Ideco H-30-D	276	5,000
Arcola						
Cascade Drlg Co Ltd	6	dsl		Natl T-20		4,500
Carnduff						
Commonwealth Drlg Co Ltd	4	dsl	260	Crdwll RL	170	4,500
	13	dsl	390	Emsco GB-350	450	6,500
Double-A Drlg Co Ltd	3	dsl	300	Ideco H-40	265	6,000
Coleville						
Precision Drlg Co Ltd	A	dsl	276	Ideco H-20-D	184	2,500
	C	dsl	276	Ideco H-30	276	5,000
Dollard						
Loffland Bros Co	100	gas	670		675	8,000
Esterhazy						
Can American Drlg Ltd	7	dsl	260	Natl T-20	260	4,500
Estevan						
Cardinal Drlg Co (Bismarck)		dsl	320	Natl T-20	320	5,000
Lohmann-Johnson Drlg Co Inc	5	dsl	300	Crdwll S	440	4,500
Parker Drlg Co of Canada Ltd	5	dsl	420	Natl 50	420	6,500
Reading & Bates Drlg Co Ltd	1	dsl	300	Natl 50-A	700	7,000
Regent Drlg Co Ltd	4	dsl	260	Brwstr N-4	260	6,000
	22	dsl	260	Brwstr N-4	260	6,000
	23	dsl	260	Brwstr N-4	260	6,000
	27	dsl	260	Brwstr N-4	260	6,000
	29	dsl	260	Brwstr N-4	260	6,000
Tri-Province Drlg Co Ltd	3	dsl	1040	Ideco 7-11	860	11,000
Hastings						
Commonwealth Drlg Co Ltd	25	dsl	425	Unit U-34-D	300	5,500
Kingsford						
Commonwealth Drlg Co Ltd	14	dsl	430	Ideco H-40	300	5,500
Hunter Drlg Ltd	1	dsl	275	Crdwll	260	6,000
	3	dsl	300	Crdwll	260	6,000
Lampman						
Commonwealth Drlg Co Ltd	6	dsl	690	Ideco M-750	600	7,000
Meadow Lake						
Peter Bawden Drlg Ltd	3	dsl	270	Crdwll S	180	4,500
Regent Drlg Co Ltd	1	dsl	260	Brwstr N-4	260	6,000
Midale						
Precision Drlg Co Ltd	6	dsl	276	Ideco H-30-D	276	5,000
Oxbow						
Commonwealth Drlg Co Ltd	5	dsl	260	Emsco GB-250	310	5,000
Double-A Drlg Co Ltd	1	dsl	300	Ideco H-30	265	4,500
General Pet of Canada Ltd	8	dsl	250	Natl T-25	250	5,000
	9	dsl	375	Natl T-25	250	5,500
	12	dsl	250	Natl T-20	250	4,600
Pleasantdale						
Cascade Drlg Co Ltd	11	dsl	—	Crdwll D	—	5,500
Prince Albert						
Big Horn Drlg Ltd	2	dsl	250	Crdwll L	180	3,500
Kenyon's Drlg & Serv Ltd	12	dsl	—	Frnks Comet 658	—	5,000
Ralph						
Commonwealth Drlg Co Ltd	24	dsl	520	Natl 50	600	6,000
Rosetown						
Can American Drlg Ltd	5	dsl	375	Natl T-32	520	5,000
Steelman						
Brinkerhoff Drlg Co Ltd	12	dsl	200	Natl T-32	300	6,000
Can American Drlg Ltd	2	dsl	650	Natl T-55	975	7,500
Commonwealth Drlg Co Ltd	12	dsl	260	Natl T-32	300	5,500
General Pet of Canada Ltd	20	dsl	275	Emsco GB-250T	550	5,000
Reading & Bates Drlg Co Ltd	9	dsl	350	Natl 50-A	450	7,000
Swift Current						
Precision Drlg Co Ltd	D	dsl	276	Brwstr N-4	276	5,000
	E	dsl	450	Ideco 525	550	7,000
Weyburn						
Central Leduc Drlg Co Ltd	1	dsl	500	Natl 50	500	6,500
	2	dsl	400	Crdwll TR-66	400	5,000
Commonwealth Drlg Co Ltd	2	dsl	550	Natl 50	420	6,500
General Pet of Canada Ltd	1	dsl	250	Natl 50	525	7,000
	2	dsl	250	Unit U-34	250	4,800
	19	dsl	435	Crdwll S	175	4,500
Loffland Bros Co	138	dsl	670	—	600	9,000
Precision Drlg Co Ltd	8	dsl	276	Natl T-20	276	4,000

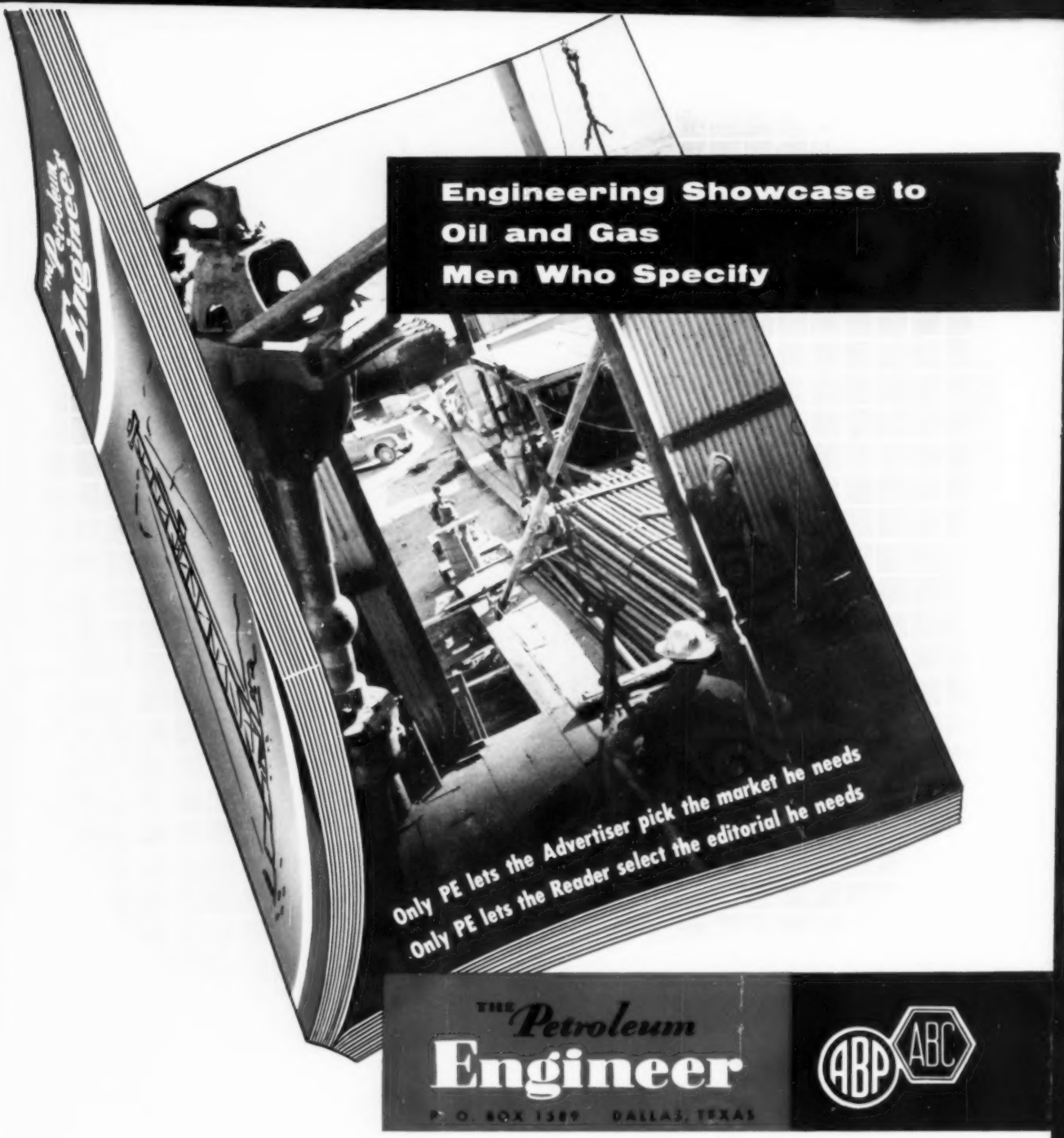
Canadian Cable Tools

Contractor's Name	Rig No.	Type Power	HP of Driving Engine	Top to Bottom Drlg Cap.	Workover and Cleanout Depth Cap.	Rig Make and Model
ALBERTA PROVINCE						
Calgary						
Anderberg & Sons Drlg Ltd	1	gaso	50	1200	2000	Star
Red Deer						
Bennett & Hurst Drlg Co Ltd		gas	—	2000	—	Mayhew 2000
QUEBEC PROVINCE						
St. Eustache Sur Le Lac						
St Eustache Well Drillers	1	gaso	35	2000	—	Armstrong 50-W
	2	gaso	22	500	—	Armstrong 35-W

SOME CONTRACT RIGS IN FOREIGN SERVICE

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
CUBA						
CUBA						
C J Simpson Drlg Co	1C	dsl-gas		Natl T-32	320	5,000
	2C	dsl-gas		Unit U-40	900	14,000
	3C	dsl-gas		Emsco D-450	700	8,500
ITALY						
Bologna						
Campagnia Industrie Metanifere E Affini (Rome, Italy)	2	dsl	260	Ideco H-30	300	4,500
Giovanni Incarico						
Compagnia Industrie Metanifere E Affini (Rome, Italy)	1	dsl	900	Ansaldo 2000	600	7,000
Sicily						
Compagnia Industrie Metanifere E Affine (Rome, Italy)	3	dsl	500	Emsco GB-500	500	8,500
	4	dsl	900	Emsco 800	900	11,000
MEXICO						
Cerralvo						
Del Mar Drlg Co	3	gas	690	Natl 75	750	10,500
NICARAGUA						
Harvey Drlg Co Inc	2	dsl	1200	Emsco GC-500	900	11,500

Contractor's Name	Rig No.	Type Power	Total HP All Main Mud Pumps	Drawworks Make and Model	Total HP Available to Drwwks	Rated Depth with 4½" Pipe
NORTH AFRICA						
Libya						
Delta Drlg Co	1	dsl	1250	Emsco A-800	900	11,000
PAKISTAN						
Southeastern Asia Drlg Co	24	dsl	1200	Oilwell 96	1600	18,000
VENEZUELA						
Perforaciones Delta, C A (Caracas, Venezuela)	1	dsl	260	Ideco H-40-D	400	6,500
	2	dsl	260	Ideco H-40-D	400	6,500
	3	dsl	260	Failing 2066	—	—
	4	dsl	260	Ideco H-40-D	400	6,500
	5	stm	1200	Emsco UBLS	1690	15,000
	6	dsl	260	Ideco H-40-D	400	6,500
	7	dsl	260	Ideco H-30-D	300	4,500
	8	dsl	600	Emsco G-500	500	8,000
	9	dsl	1000	Emsco GB-800	900	12,000
	10	dsl	260	Crdwll O	450	7,500
Lake Maracaibo (Offshore)						
Perforaciones Delta, C A (Caracas, Venezuela)	11	dsl	130	Natl T-12	120	2,500
	12	dsl	1560	Emsco J-1250	1250	15,000
	13	dsl	1040	Emsco J-1250	1250	15,000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